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Digital Documentation of Element Condition for Bridge Evaluation

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MATC

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16. Abstract
Bridge condition inspection data provide critical and rich information for assessing structural condition. Currently, the majority of bridge inspection methods use printed checklists, and their interpretation is labor intensive, subject to personal judgment, and prone to error. To realize the full benefits of bridge inspections, there is a need to automate the data management process. This research project implemented Bridge Information Modeling (BrIM) technology for bridge inspections and compared it to the conventional approach of paper checklists. This environment combines a 3D representation of the infrastructure, and allows the integration of inspection data, such as the presence of damages, types of damages, severity, localization and previous maintenance decisions. In this report, BrIM acronym is used to refer to the database that integrates a 3D bridge model and bridge element condition data. In order to validate this approach, 2D drawings and previous inspection and maintenance data of two bridges located in Ames, Iowa were obtained and modeled using Revit software. Both models were then synced using cloud based solutions so that they could be accessed from tablet computers on-site. Then, the BrIM based inspection methodology was tested with Iowa DOT engineers and bridge inspectors, who confirmed that BrIM would be beneficial to automatically query, sort, evaluate and send information to decision makers. Furthermore, a web-based survey with several DOT engineers and bridge inspectors was conducted regarding possible expected benefits of using 3D BrIM based solutions for inspections. It is concluded that this methodology has the potential to substantially improve bridge assessment and maintenance operations, which would result in time and cost savings associated with bridge inspection and assessment, as well as improved structural resiliency as a result of more effective and comprehensive bridge management means.

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DISCLAIMER

ABSTRACT

Bridge condition inspection data provide critical and rich information for assessing structural condition. Currently, the majority of bridge inspection methods use printed checklists, and their interpretation is labor intensive, subject to personal judgment, and prone to error. To realize the full benefits of bridge inspections, there is a need to automate the data management process. This study implements Bridge Information Modeling (BrIM) technology for bridge inspections and compare it to the conventional approach of paper checklists. This environment combines a 3D representation of the infrastructure, and allows the integration of inspection data, such as the presence of damages, types of damages, severity, localization and previous maintenance decisions. In this study, BrIM is used as a central database that integrates 3D bridge model and bridge element condition data.

In order to validate the proposed approach, 2D drawings and previous inspection and maintenance data of two bridges located in Ames, Iowa, were obtained and modeled using Revit software. Then, the models were synced using a commercially available cloud based data management solution, which enables access to the models from tablet computers on-site. The BrIM based inspection methodology was tested with Iowa DOT engineers and bridge inspectors, who confirmed that BrIM would be a valuable tool to automatically query, sort, evaluate and send information to decision makers. In addition, a web-based survey with several DOT engineers and bridge inspectors was conducted to understand the possible expected benefits of using 3D BrIM based solutions for bridge inspections.

Finally, it is concluded that this methodology would substantially improve bridge assessment and maintenance operations, resulting in reduced costs associated with bridge inspections and enhanced structural resiliency. Furthermore, limitations and challenges of this methodology were also indicated; such as software interoperability issues and inability to attach inspection pictures to 3D model elements.

1. INTRODUCTION

1.1 Background

The Federal Highway Administration (FHWA), according to Federal-Aid Highway Act of 1968, requires all states to perform a biennial inspection for each bridge to document its condition. Current bridge inspection and assessment methods rely heavily on a reiterative process of manual data entry and extraction, which are subjective, error prone and time consuming. The majority of bridge inspections in the U.S. are conducted by visual inspection, in which a printed checklist is filled by trained inspectors. The FHWA and Nebraska Department of Roads (NDOR) are in the process of transitioning from a function-based rating system to an element-based condition rating system. The transition will be quite complex for some bridges because of the numerous and nearly identical elements that are part of the structure (e.g., bridge girders). Physically identical elements often show very different patterns of distress depending upon their location in the structure. An inspector must correctly identify the type and location of each element being inspected, document its distress, manually record this information in the field and then transcribe that information to the bridge evaluation database after arriving back at his/her office. This is a complex and time-consuming set of responsibilities which are prone to error.

Bridge Information Modelling (BrIM) is a fairly new technology that is still in its infancy in terms of its adoption in the heavy civil industry. BrIM technology enables storing all bridge data, including its drawings and models, material specifications, inspection notes and others, in a central database that can be accessed both from the office and the field. This gives an opportunity to adopt BrIM to develop an automated bridge inspection methodology. BrIM has many proven benefits such as reduced construction duration and cost savings when implemented during design and construction. However, the benefits of adopting it for inspection purposes are still uncertain. Therefore, this project aims to address this knowledge gap by implementing a novel framework that employs BrIM and cloud computing technologies for bridge inspection and assessment.

The framework was tested to determine its applicability for bridge inspection. The test/mock inspection was conducted for a bridge located in Ames, Iowa with the collaboration of Iowa DOT personnel to evaluate and compare the current and proposed inspection practices. Furthermore, a survey was conducted among eight other DOTs in order to better understand current and possible future BrIM applications at their institutions. The survey included questions regarding 3D modelling, BrIM applications in general, as well as BrIM adoption for bridge inspections. It is concluded that this methodology would substantially improve bridge inspection, assessment and maintenance operations by enabling better management of data.

1.2 Literature Review

The U.S. economy depends heavily on its road network and bridges. Any failure in maintaining this network can cause substantial economic losses (Elbehairy 2007). In order to keep this network maintained, all states must perform a biennial inspection for each bridge to document its condition. This requirement puts a cumbersome responsibility on state DOTs to manage their assets. As a result, standalone Bridge Management Systems (BMS) (e.g., AASHTOWare PONTIS and VIRTIS) were adopted to satisfy DOTs needs such as: the operational requirements, planning and program management, e.g., load rating, permitting and routing. However, those systems do not satisfy the need to coordinate management tasks of all phases of a bridge life cycle i.e., design, construction, operations and program management (Shirolé 2010). Furthermore, they require re-entry and transformation of data, which is a cumbersome, redundant and error prone process. On the other hand, comprehensive asset management solutions such as BrIM could improve the deployment of services and maintenance resources, reduce maintenance costs and increase the quality of services (Zhang et al. 2009). BrIM benefits are being recognised by DOTs and asset owners (Howard and Björk 2008). While the current BMS do not satisfy the need for a more comprehensive solution covering the entire life cycle of a bridge (Shirolé 2010), BrIM could offer an integrated comprehensive solution for life-cycle bridge management (Chen and Shirolé 2006; Chen and Shirolé 2007; Shirole et al. 2009; Shirolé 2010).

The majority of bridge inspections in the U.S. are conducted by visual inspection, in which a printed checklist is filled by trained inspectors. The FHWA and NDOR are in the process of transitioning from a function-based rating system to an element-based condition rating system. The transition will be quite complex for some bridges because of the numerous and nearly identical elements that are part of the structure (e.g., bridge girders). Physically identical elements often show very different patterns of distress depending upon their location in the structure. An inspector must correctly identify the type and location of each element being inspected, document its distress, manually record this information in the field and then transcribe that information to the bridge evaluation database after arriving back at his/her office. This is a complex and time-consuming set of responsibilities which are prone to error.

Building Information Modeling (BIM) is an emerging technology that has gained increasing popularity among designers and contractors in the civil, architectural, and construction industries. BIM is the development and use of a 3D digital model to simulate and represent the design, construction and operation of a facility. This model is a data-rich, object-oriented, intelligent and parametric digital representation of the facility, where data appropriate for various users' needs can be extracted and analysed in order to generate useful information for decision makers in a facility and improve the process of delivering a facility (Eastman et al. 2008; AGC 2006). Despite a variety of definitions, the agreement is reached that BIM is a digital representation of a facility. Also, it is widely accepted that BIM is not only a modeling software, but an integrated design and construction process providing a collaboration and communication platform for various parties throughout the project lifecycle (Carmona and Irwin 2007; Teicholz 2013). Bridge Information Modeling (BrIM) is the specialization of BIM for bridge projects. Other similar terms in the field include Heavy BIM, Horizontal BIM, Virtual Design and Construction (VDC) and 3D Engineered Models for Construction. BrIM (Chen et al. 2003; Janjic et al. 2008; Lee et al. 2012; Tah et al. 1999), which enables management of information in a three-dimensional (3D) environment (Eastman et al. 2008; Thomas et al. 2001) would enable inspectors to access accurate, intelligent 3D models of the inspected infrastructure (Cylwik and Dwyer 2012).

Heavy civil construction projects such as bridges have unique characteristics compared to a typical building construction project. Various land contour, changing site conditions over the long span of a project, existing infrastructure segments and traffic coordination during construction are some of those unique characteristics that impact the design and construction of a new project (Cylwik and Dwyer 2012). Previous research has highlighted the potential benefits that can be obtained from implementing BrIM for bridge maintenance and operations. Shirolé (2010) summarised the benefits that can be achieved by adopting BrIM for bridge management as follows: 1) satisfied data needs at project level; 2) elimination of repetitive manual transcription of data; 3) improved data quality, reliability and speed of bridge inspection; 4) easy access to bridge safety related data so that it can be extracted and updated in an efficient manner; 5) improved communication between inspectors and bridge engineers by providing virtual models which would eliminate the need for re-inspections and improve well inform the decision makers; and 6) cost effective bridge life cycle management (Shirole et al. 2009). Possible benefits of BrIM for bridge management are acknowledged both in academia and industry. However, its actual benefits for managing existing bridges is still unclear (Marzouk and Hisham 2011). This project aims to create a better understanding of bridge inspection needs and how to meet them using BrIM. A novel framework based on BrIM technology (Chen et al. 2003; Janjic et al. 2008; Lee et al. 2012; Tah et al. 1999), which enables management of information, in a three-dimensional (3D) environment (Eastman et al., 2008; Thomas et al. 2001), is created and tested with cooperation of Iowa DOT. Their feedback, in addition to seven other DOTs, on possible benefits of BrIM for bridge inspections and management was recorded and analyzed.

1.3 Project Scope

Case study approach was used to assess the BrIM based bridge inspection framework. The data from two existing bridges located on highway US 30 spanning the Skunk River near Ames, Iowa were used for the case study. Two dimensional (2D) plans and historical inspection data of the bridges were provided by Iowa DOT to the research team in electronic document format. The research team then combined all this data in a 3D information model, i.e., 3D BrIM, for each bridge. The 3D BrIM models were developed in Autodesk Revit environment, and uploaded to Autodesk data cloud, so that they could be accessed from a tablet computer via Autodesk BIM 360 Glue application. BrIM based inspection framework was then tested with Iowa DOT engineers and bridge inspectors, who confirmed that BrIM could be a valuable tool to automatically query, sort, evaluate, and send information to decision makers.

A web-based survey, using the Qualtrics survey tool, was conducted in order to evaluate applicability of BrIM for inspection purposes in other states outside Iowa. The survey was sent out to eight DOTs in the Midwest in addition to New York and Pennsylvania DOTs to obtain their feedback on implementing BrIM technology for bridge inspection and maintenance. DOT personnel ranging from bridge engineer to a director of bureau of structures from eight different DOTs participated in the survey. The details of the mock inspection with Iowa DOT inspectors and the web-based survey are included in Section 5 and Appendix D.

2. RESEARCH OBJECTIVES

The overarching objective of this research is to improve infrastructure safety and reduce inspection costs by providing BrIM-based inspection procedure. To attain this objective, the research is divided into three main tasks: 1) collect and analyze inspection data; 2) create a 3D bridge information model; and 3) validate and demonstrate the BrIM-based inspection procedure.

For the first task, Iowa DOT provided the research team with the 2D plans and previous inspection data of two existing bridges on Highway US30, a concrete bridge and a steel one, located near city of Ames in the state of Iowa. Task 2 involved in analyzing and transferring the 2D drawings and previous inspection data of the bridges into a 3D BrIM model using Autodesk Revit software package. The traditional way of bridge inspection was mimicked when creating the 3D BrIM model. Furthermore, the research team uploaded the BrIM model to Autodesk cloud so that it could be accessed from a tablet computer using Autodesk BIM 360 Glue application. This application also allows uploading inspection information to the BrIM model directly from the field. The BrIM-based inspection framework was validated and demonstrated in Task 3. First, the research team validated the procedure on the field for the existing bridges on US-30 near city of Ames, Iowa. A mock inspection with Iowa DOT personnel was followed in order to obtain their feedback on the proposed inspection framework. The research team implemented their feedback in the 3D models. Furthermore, the research team conducted a web-based survey among eight state DOTs. The questionnaire covered questions related to information technology adoption, 3D modeling, and traditional bridge inspection practices. The team incorporated the questionnaire results in the conference paper submitted to the 2015 CSCE International Construction Specialty Conference (ICSC 2015), and is also preparing a journal article to be submitted to ASCE Journal of Infrastructure Systems.

2.1 Task 1: Data Collection and Analysis

The research team, made of two full time faculty members and a graduate student, worked with Iowa DOT to collect plans and previous inspection data for two existing bridges; bridges 8550.2.R.030 and 8550.2.L.030, steel bridges (Figure 1), and bridges 8548.4.R.030 and 8548.4.L.030, pre-stressed concrete bridges (Figure 2), all located on highway US-30, in the state of Iowa.

Map data ©2014 Google

Figure 1. Bridges 8550.2.R.030 and 8550.2.L.03

Map data ©2014 Google

Figure 2. Bridges 8548.4.R.030 and 8548.4.L.030

Detailed element condition data, 2D drawings, and other specifications of the bridges were obtained from Iowa DOT. Furthermore, the research team studied the traditional way of bridge inspection with the help of Iowa DOT inspectors. This helped in creating a better understanding of whole process of inspection and in defining the requirements for bridge inspection. The research team learned the following details about the current bridge inspection practice.

Currently, inspectors place themselves facing the direction where the number on the street mileposts increases. Inspectors depend on the mileposts of the street to define the name and the location of the bridge. There are two numbers for each bridge: state number and Federal Highway Administration (FHWA) number. FHWA number does not change, but the state number may change due to milepost changes (the road length maybe changed). For example, for the bridge studied in this project, FHWA bridge number is 48730, and the state bridge number is 8550.2.R.030. The first two digits, 85, indicate that the bridge is located in Story County. Next digits give the milepost information, i.e., the bridge is located on milepost 50.2. R stands for Right, and L stands for Left. And finally "030" tell us that the bridge is located on US 30. Once orientation completed, inspectors count the piers and abutments from what is behind them while facing the direction of the increasing number of mileposts and number them from 1 to the final number of piers. The girders are numbered according to their position to the inspector from left to right. Then basic sketches for near abutment and far abutment are drawn and used for orientation purposes.

Mainly, a bridge is divided into three groups i.e., deck, super structure and sub-structure. Usually the inspection team divides the main three groups between the team members and each group is inspected using a separate inspection sheet. The other method is doing a loop by starting with one group to the next until they finish. The condition of each element at the time of inspection is documented to the best judgment of the inspector and according to the measurements that the inspectors' take from the damaged area, i.e., in concrete structures, the inspectors look at the integrity of the bridge, specifically corrosion, spalling, concrete cracks and paint cracks-. A crack comparator scale is used to measure the width of the crack. Any crack that is at least 1/16 inch wide should be watched. The depth of the crack is not measured; however if rust was found, it is considered as an indication that the crack is deep and requires further inspection.

Then, the inspection team draws manual sketches to document the type of damage, its size, severity, depth and location using true dimensions. Sketches are drawn on pre-drawn basic sketches that are not bridge specific which requires more effort to deliver its intended message. Inspectors use a predefined legend (Figure 3) to represent the different treatments or problems of bridges. Finally, the report and the sketches are taken to the office where a comparison with the last inspection is carried out, and an action is taken to fix problems, if any existed.

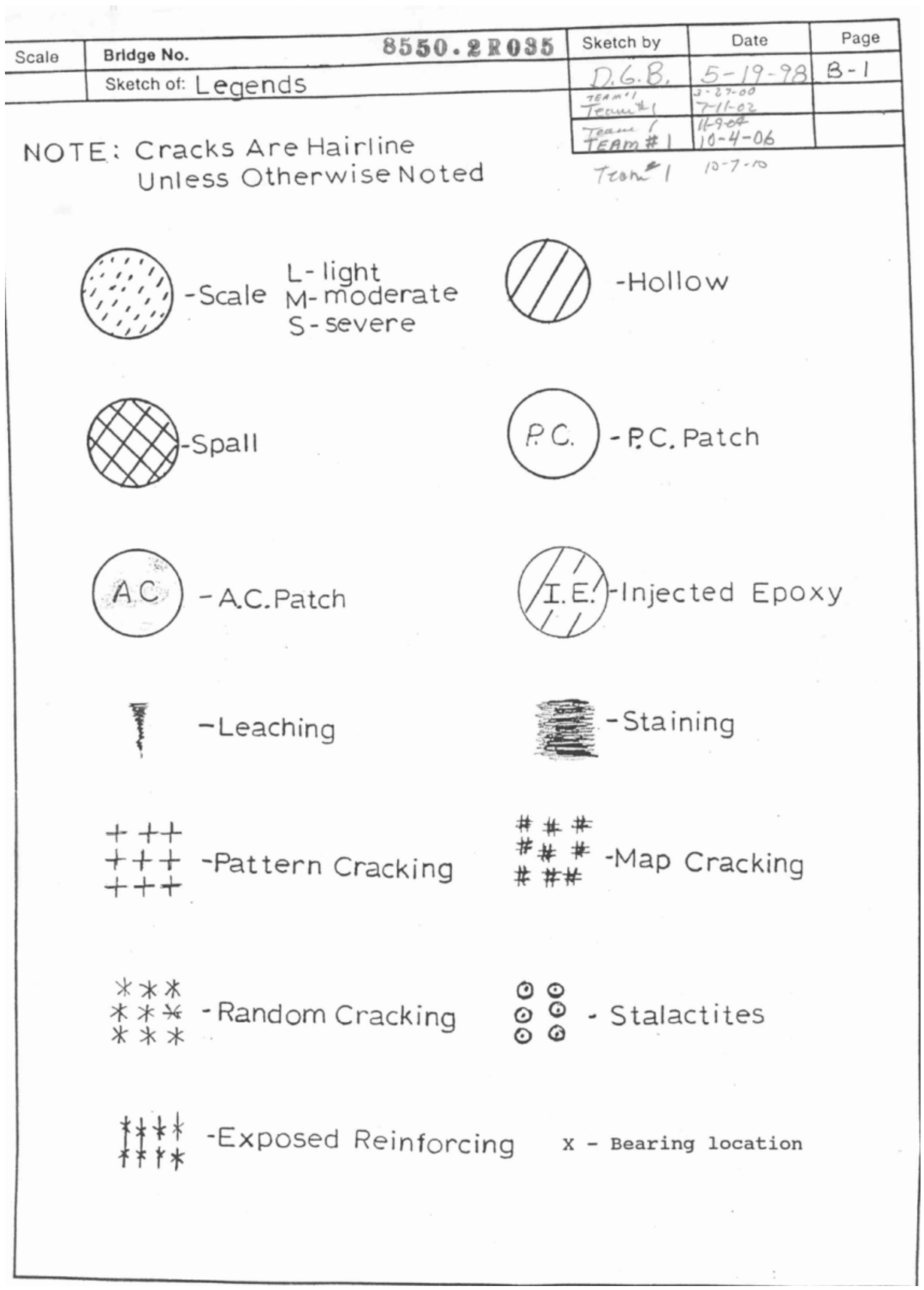

Figure 3 Inspection sketch legend sample

2.2 Task 2: 3D Bridge Information Modeling (BrIM)

Two dimensional (2D) plans and historical inspection data of the bridges were provided by Iowa DOT to the research team in electronic PDF document format. The research team then combined all this data in an intelligent 3D model, i.e., 3D BrIM (Figure 4). Most elements were created from scratch depending on the 2D drawings and other dimensional specifications that were provided by Iowa DOT. Autodesk Revit was used for modelling the bridges. This software enabled modelling the bridges elements in great detail (Figure 5) as well as defining the specifications required for each element e.g., material types, dimensions, capacities, etc.

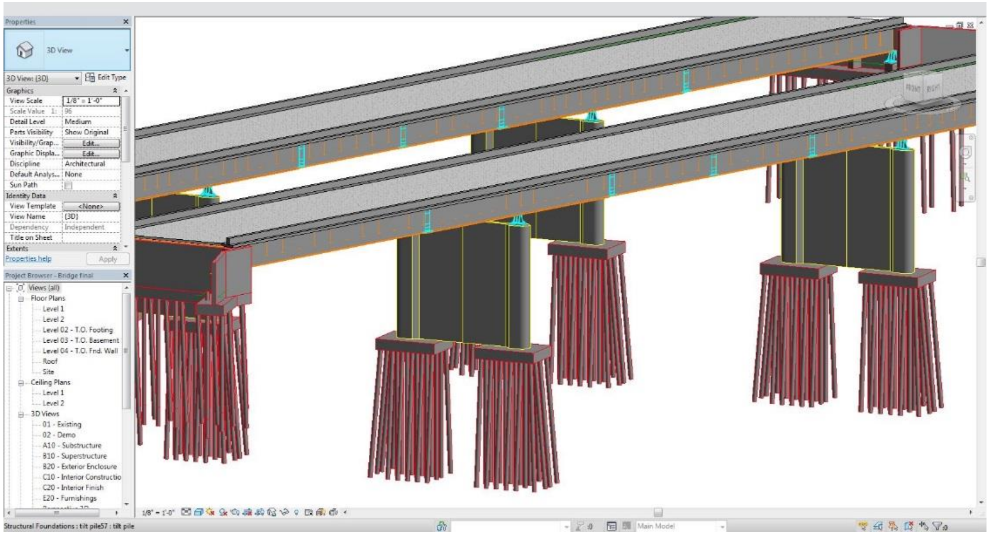

Figure 4. Bridge Information Model (BrIM)

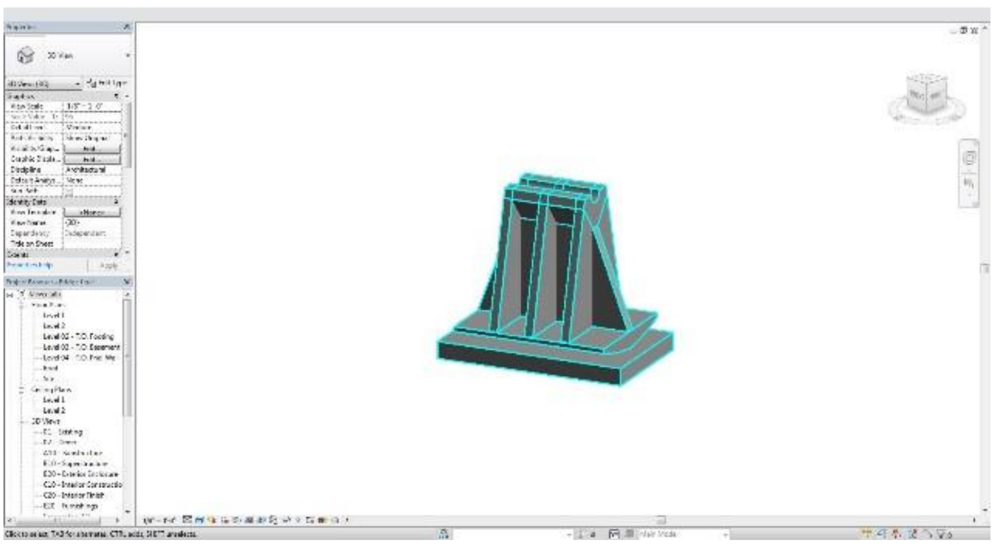

Figure 5. Detailed hinge

Model Development and Calibration

The traditional way of inspection was mimicked while creating the 3D BrIM model, i.e., model elements were divided into same major group types: deck, super structure, sub-structure, channel and piers (Figure 6). The reason for this was not only to prioritize the major bridge components and to focus on the structurally critical elements, but to provide an easier transition for inspectors from the traditional way to the BrIM way of inspection. Each of those categories can be separated as single models, and merged back with another later on. Such characteristic allows downloading and uploading lighter BrIM models to the data cloud, in addition to providing faster manipulation and easier control of the model. Each group is given a specific color, and each element is provided with the necessary identification information such as: element ID, element material type, element casting type, etc. In addition, inspection information with its technical details is provided as attached documents to the model, not directly linked to a specific element.

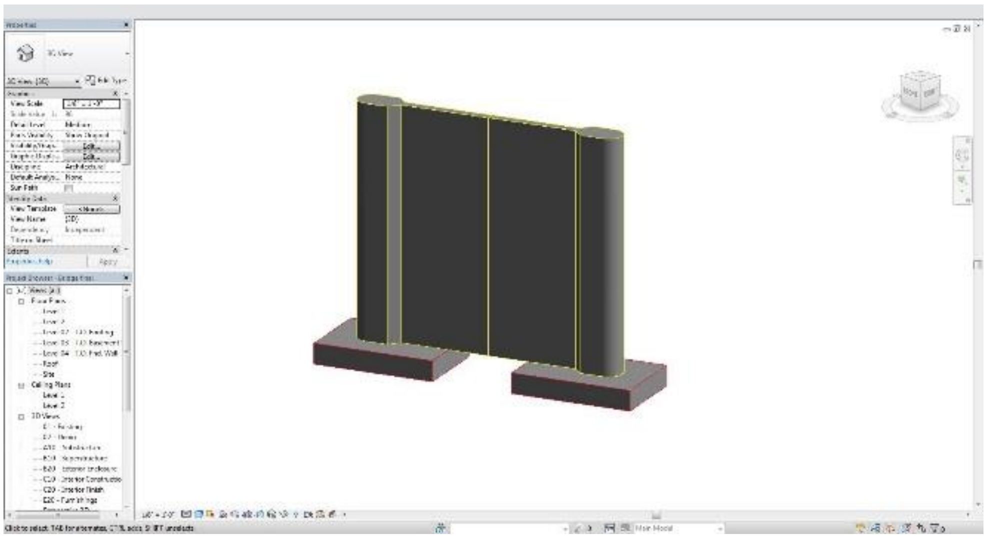

Figure 6. Piers group isolated

Furthermore, the 3D BrIM models were uploaded to Autodesk data cloud, so they could be accessed from a tablet computer via Autodesk BIM 360 Glue application while on-site. Autodesk BIM 360 Glue allows users to enter inspection data directly to the model. The model is then uploaded to Autodesk cloud, and accessed from the office computer. Autodesk BIM 360 Glue application can be downloaded on mobile devices like tablet computers. One major benefit of this application is that it is connected to the Autodesk data cloud. This application was used for this research due to its availability to the researchers; however an application and data cloud could be used. This application enables uploading and downloading the model as well as drawing sketches on the model (Figure 7); in addition, it also enables writing inspection notes and taking dimensions directly on the model (Figure 8).

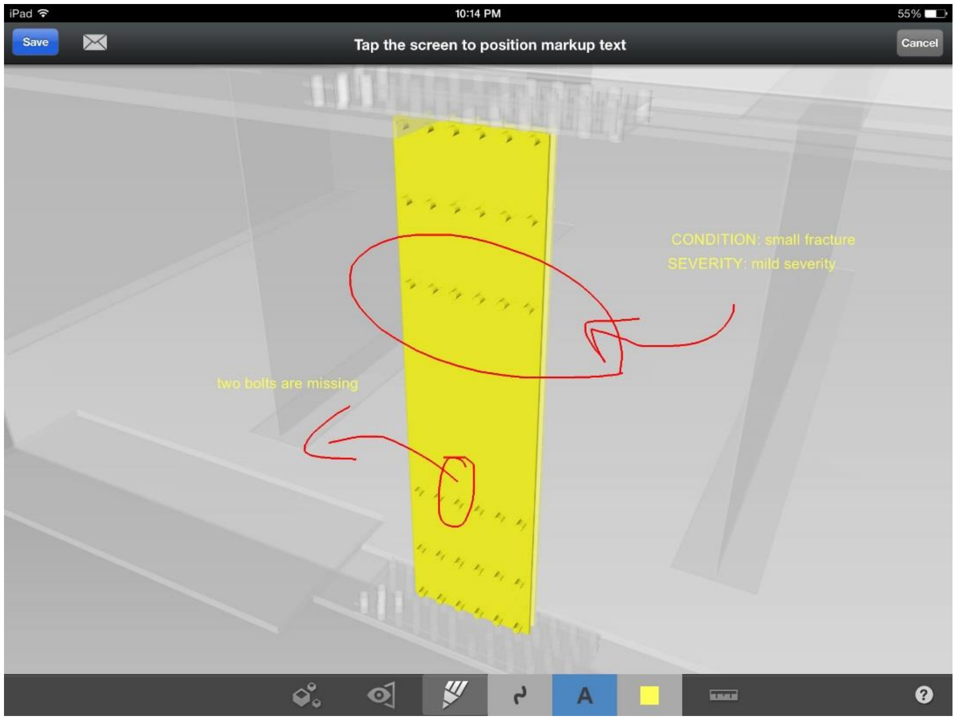

Figure 7. Drawing sketches and entering notes in BIM 360 Glue

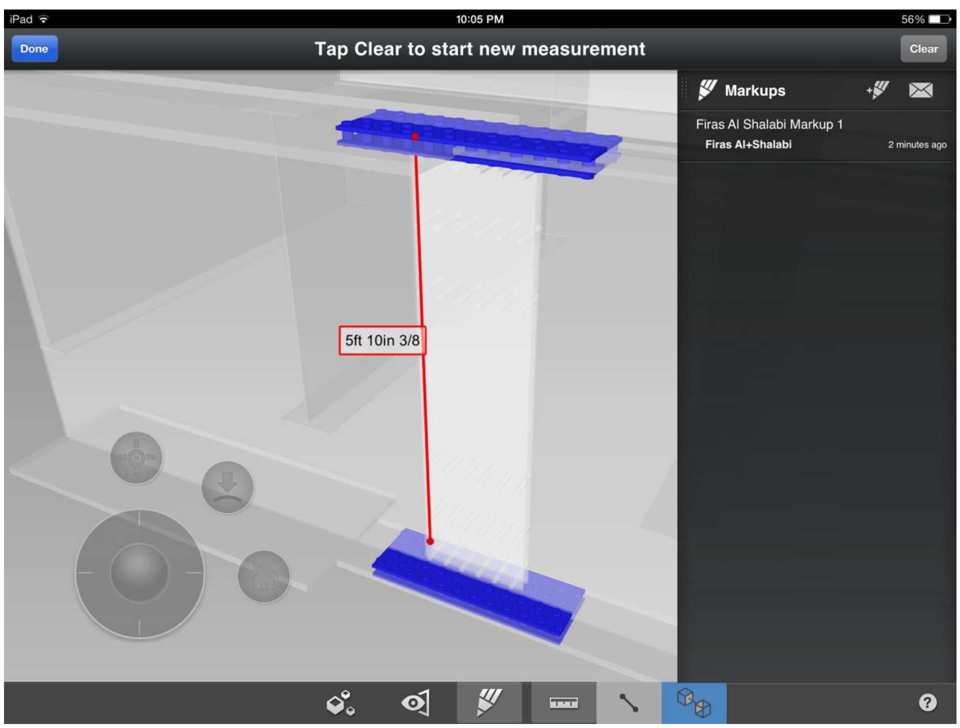

Figure 8. Dimension measurements in BIM 360 Glue

2.3 Task 3: BrIM-Based Inspection Validation and Demonstration

The research team developed a framework for bridge inspections using BrIM (Figure 9). The BrIM-enabled inspection framework consists of three major elements; data cloud, mobile devices and home office computer interface. The data cloud receives information from both home office and site inspectors and shares it with all stakeholders at DOT. This procedure could increase the speed of communication and eliminate any re-entry of the inspection data. It can also prevent any data losses.

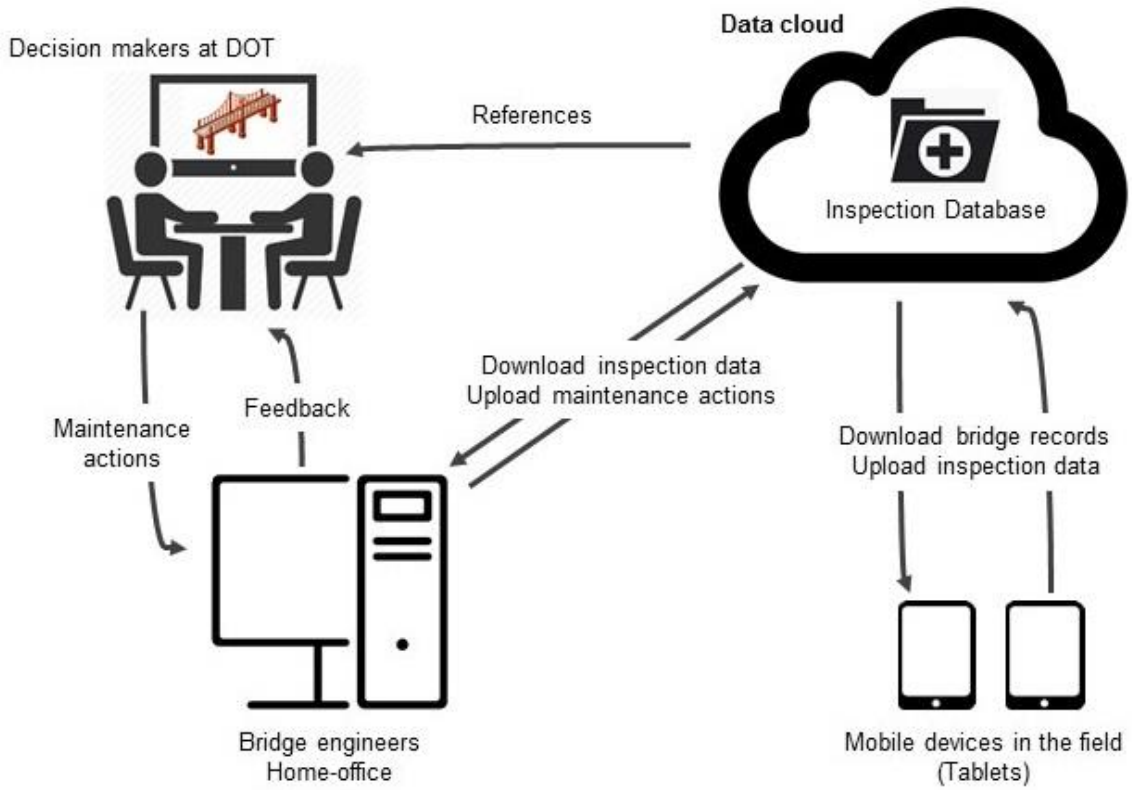

Figure 9. BrIM-based inspection framework

This framework was tested with Iowa DOT engineers and bridge inspectors. Once an inspector logs in to his/her account, he/she has direct access to the data cloud that acts as a data center for inspection documents and information. All inspection actions are documented under the inspector's name with the date and time of the action and uploaded directly to the data cloud. Every element that is inspected has its unique ID number, which would eliminate any ambiguity in determining the position of damaged elements. The software application also enables isolating selected elements and provides the right angle to define the damage.

Inspectors can choose the element that has a deficiency where they can document the problem e.g., corrosion, spalling, cracks, etc. At the same time, it is possible to pull out the previous inspection data and sketches to compare the damages and their severity. Furthermore, it is also possible to freeze the model on the angle that best shows the damage to create a still image (take a snapshot), which would enable inspectors to draw sketches about the damage on that specific element with precise dimensions (Figure 10). Then, the inspection information can be uploaded back to the data cloud where can be accessed from different locations, such as main office. Furthermore, bridge engineers at the main office can access and analyze the data real-time or immediately. Also, BrIM model provides a better representation of the field conditions, which would enable other stakeholders to have a better idea of the problem, thus they can make better informed decisions.

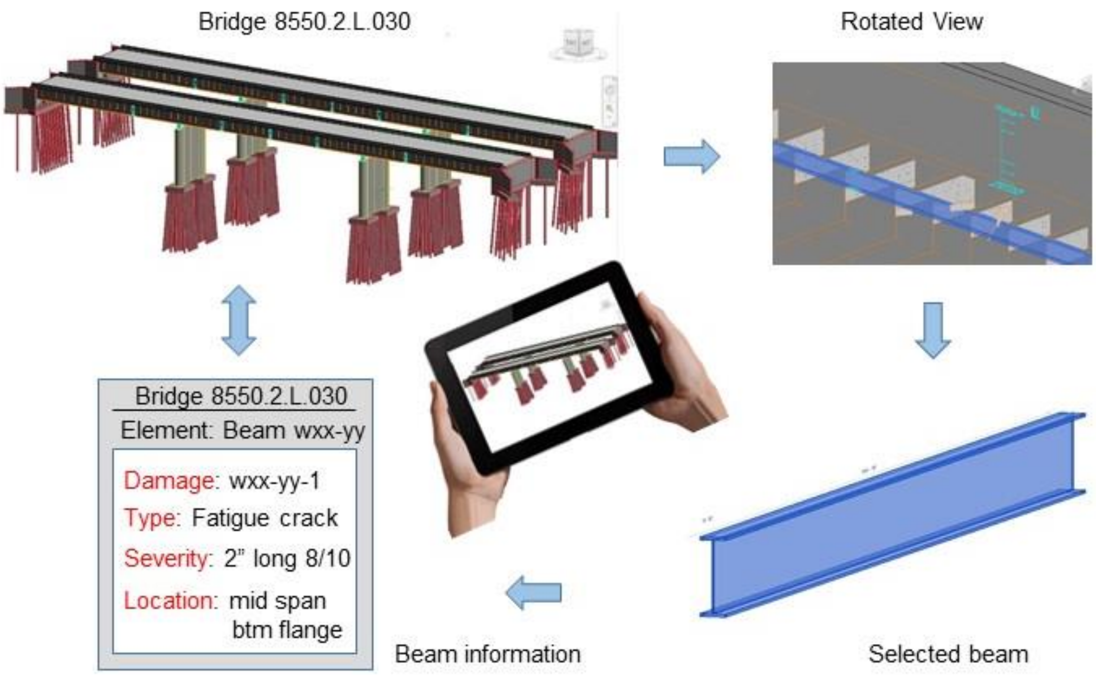

Figure 10. BrIM-based inspection process

The research team demonstrated the BrIM-based inspection methodology (Figure 11) with the help of Iowa DOT personnel in order to get the experts' feedback on it. Many elements of the bridge were inspected, including the hinges, concrete cracks, girders and piers.

Figure 11. BrIM on-site demonstration

Iowa DOT bridge engineers and inspectors confirmed that BrIM can be used to automatically query, sort, evaluate and send information to decision makers. They also provided some good feedback and recommendations that will be discussed later in this report. Moreover, a web-based survey, using the Qualtrics survey tool, was conducted in order to evaluate applicability of BrIM for inspection purposes in other states outside Iowa. The survey was sent out to eight DOTs in the Midwest in addition to New York and Pennsylvania DOTs to obtain their feedback on implementing BrIM technology for bridge inspection and maintenance. DOT personnel ranging from bridge engineer to a director of bureau of structures from eight different DOTs participated in the survey.

The questions varied between open format questions where DOTs personnel provided their feedback, and closed format questions that varied between Dichotomous questions and Likert questions. The questions were directed to understand three key aspects; the first one was whether the DOT has any experience in using BrIM technology and how they are using it. The second one was to find out whether they are facing any problems with the current bridge inspection practices. Finally, the third one was to determine the potential of the proposed BrIM based framework for inspections.

The surveyed DOTs acknowledged the benefits of BrIM and showed interest in using it. However, they expressed several difficulties and challenges they are facing when implementing it during design and construction phases. Furthermore, most DOTs acknowledged that BrIM would be beneficial for bridge inspection. The detailed findings of this survey are summarized in Table 1.

According to the survey, the number of qualified bridge inspectors range from 10 to 50 among the states surveyed in this study. This number can reach up to 650 when consultants and freelance inspectors are included. Typically 2-4 inspectors are required for inspection of a regular bridge. The number of inspectors can reach up to 7 for inspection of special types of bridges such as over water bridges. The yearly cost of inspections varies among states as the number of bridges and the size of the states vary. When asked what means are being used for bridge inspections in the current practice, 71% of respondents said that they use the paper based method. And the other 29% of the respondents stated that they are using mobile computing technologies such as Personal Digital Assistant (PDA), tablets and laptops. About 50% of the surveyed states responded that their DOTs use 3D information models and information technologies during design and construction of civil projects, and 33% of the respondents stated that they are using it specifically for bridge design and construction. This result is compatible with the opinion that states that large asset owners are moving towards more comprehensive tools to manage their assets (Howard and Björk 2008; Zhang et al. 2009).

The DOTs who participated in this survey recognized BrIM as a beneficial tool for bridge inspections. However, they are not planning to adopt it in their bridge inspection practices in the near future. The reason for this maybe the invalidated benefits of BrIM for the inspection process (i.e., BrIM must prove its ability to improve inspection process over current practices). In this study, while conducting the mock-up inspection, the time needed for inspecting each element as well as signing and dating the inspection documents were reduced significantly. This is mainly due to the user friendly sketch drawing and input recording functionalities of the software.

The surveyed DOTs predict several challenges that maybe faced when implementing BrIM technology for bridge inspections. One major challenge mentioned by most survey respondents was the concern of damaging portable electronic devices during the inspection process. They stated that electronic portable devices used for inspection tasks must be durable in rain, sunshine and extremely cold weather conditions. And they need to be sturdy enough so that they do not break down if dropped; should be small enough to fit in inspector’s harness, and large enough for sketching and visualization. This problem was also stated in the literature (Chen and Kamara 2008; Tsai et al. 2014), and can be overcome as mobile devices are being improved continuously; e.g., their mobility, durability, hardware compatibility and battery life being improved constantly to satisfy the needs of construction job environments. Moreover, a variety of accessories are available to protect tablet computers in harsh outdoor environments.

Table 1. Survey results

Task	Results	Remarks
Inspection Means	71% paper based 14% PDA 14% others	
Number of Inspectors	15 – 75	The number can reach up to 650 with all qualified consultants
No. of inspectors in each inspection	2 – 4	Can reach 7 for major over water bridges
BrIM usage in design & construction	33% using it	
Challenges in the current practice	60% have challenges	• Close observation and management to stay on compliance • Training inspectors • Inadequate staff • Aging staff • New problems with new bridge designs
Future use of BrIM in inspection	71% denied any future plans	
BrIM staff knowledge	62% poor – fair 13% good 25% very good - excellent	
Usefulness of BrIM for inspection	71% neutral	29% sees it as useful
BrIM Improve the speed and precision of inspection	71% disapproved	
BrIM implementation challenges		• Damaging portable electronic devices • Cell phone signals • Sturdy equipment to handle rain, sunshine, and extremely cold weather • Initial cost • Time invested in creating models
Institutional barriers		• Training • Digital signatures issues • Integrity of data during transmission • Confidential information

Another critical challenge mentioned was cell phone signals. There are many bridges located in rural areas where no cell phone service is available. The authors and other researchers (Tsai et al. 2014) suggest an offline BrIM approach to overcome this challenge. An offline BrIM tool for inspection enables downloading all models before arriving to the site. The inspector can record and save all inspection data on the device while offline and upload them to the data cloud when he/she has a wireless connection. This procedure was tested during the mock-up inspection with Iowa DOT inspectors where no cell phone signal was available under the bridge. Another challenge mentioned was related to the initial costs of implementing a new technology, along with the software costs, cost for keeping them up-to-date. In addition, initial investment in time and money to build 3D information models of existing bridges needs to be taken into consideration. The authors suggest that this barrier could be overcome by adapting new technologies into current practices gradually. In addition, case studies from institutions that received benefits from implementing new technologies in their projects would help and encourage other asset owners adopting new tools and technologies into their practices. For example, (Cox et al. 2002) documented that using mobile devices such as PDAs reduce costs and labor time during data collection.

While many DOTs listed lack of resources and initial investment cost as an institutional barrier to implementing BrIM for inspections, others listed human factor as a barrier, such as inspector's education and training. And some DOTs were concerned about legal issues such as digital signatures of inspectors, integrity of data during transmission and the critical details that must be kept confidential for security purposes.

When asked about the current inspection practices, around 60% of the responses admitted that DOTs are facing many challenges with the current inspection practices. The main challenge is to conduct inspections on time in order to comply with the federal law. Furthermore, challenges in training inspectors, inadequate staff, aging staff and new inspection problems with newer bridge designs were also mentioned. Overall, the current inspection practices challenges DOTs in their bridge management practice as there are problems with effectively processing and integrating inspection data with bridge management databases (Agrawal et al. 2009; Lee et al. 2008; Shirolé 2010).

The surveyed DOTs stated lack of knowledge in using 3D information modelling. On a five level Likert scale ranging from poor to excellent, 62% of surveyed DOTs considered themselves having fair or poor knowledge; while 13% considered themselves as good and 25% ranged between very good and excellent. Finally, 71% of the surveyed DOTs did not think that uploading inspection data to the data cloud directly would increase the speed and precision of the inspection. This might explain the small percentage (28%) of the surveyed DOTs that indicated having future plans for implementing BrIM in their bridge inspection process.

3. RESULTS AND LIMITATIONS

3.1 Results

Information modeling implementation has first started in the area of building design and construction. However, the flexibility of the technology made it possible to expand it to include not only vertical construction projects, but also horizontal ones. Building Information Modeling (BIM), is defined as the digital representation of a physical system, and can also be applied to transportation infrastructure, including highways – (Civil Information Modeling or CiM), and bridges (Bridge Information Modeling or BrIM). This technology is not limited to the design phase or the construction phases, but can be applied to the collective knowledge that forms a reliable source for decision making during the life cycle of a facility especially during its operation as well.

Despite the availability of BrIM technology, most bridge inspections are still conducted manually with minimum support from information technology, and the collected data is entered manually into a computer system. Bridge inspection is considered a time consuming and redundant task in the traditional way. Errors are likely to occur depending on the way the inspection is conducted and based on the inspector's experience and personal judgment. Automation of the bridge inspection processes could result in substantial time and cost savings, while optimizing the process. BrIM based inspection application gives bridge inspectors a model that can be related to, and minimizes the time and effort spent on drawing sketches of damaged bridge elements and describing their location since all inspection data is pinned directly to the model on site using BrIM applications that are available for tablet computers. The inspection data can then automatically be downloaded to the data cloud and then to the original BrIM model, which would eliminate the tedious task of re-entering the data manually.

BrIM, if used for inspection, can reduce the time needed for each inspection by improving the way sketches are drawn on site as well as the time needed for signing and dating each inspection paper. It would also increase the accuracy of inspections by enabling the notes and the drawings to be bridge element specific. This would lead to reduced number of site visits needed for each bridge, which would automatically translate into cost savings. Also, it would have a positive impact on personnel safety as it helps decreasing the amount of time spent on the field. Having more accurate inspection data that does not require any re-entry to the database would save asset managers' time and effort, which would allow them to focus on more important tasks.

During the mock inspection, the research team compared the current inspection practice with the BrIM method in terms of safety, efficiency, effectiveness and sustainability. The BrIM methodology exceeded the current practice in terms of safety and sustainability. This was mainly due to the reduced number of site visits, and elimination of data re-entry.

3.2 Limitations

The research team faced a number of challenges when modeling the bridges in 3D. Those challenges were mainly related to the software compatibility as Autodesk Revit is not the ideal software for modeling bridges. However, it was selected because of its compatibility with Autodesk® BIM 360TM Glue® application that is compatible with tablet computers, and this application was conveniently available to the research team. The main problem that was faced is the lack of ready connection details in the software such as bridge hinges, steel bolted plates, and bridge size girders. However, such challenges were overcome by remodeling the needed details from scratch using Revit® software. The modeling process took about 30 – 40 working hours; but this could be improved if the right software and a database of bridges' details were available to the research team. Furthermore, it is important to note that the research team did not have previous experience in modeling bridges in 3D, which also contributed to the increased modeling time in this research study. Autodesk® BIM 360 TM Glue® application tested in this study has two main drawbacks. The application is available only for iPad at the moment, not for any other tablet computers which limits the number of end users. And, in its current form, it does not support attaching images to model elements. Bridge inspectors could greatly benefit from being able to attach pictures to specific model elements since pictures are one of the items collected during bridge inspections. One other problem that was faced by the research team and was noted by the surveyed DOTs is the wireless signal. This problem can be overcome by working in the offline mode, which allows entering and saving inspection on the wireless device, i.e., tablets, and uploading it later to the data cloud when a wireless network is available.

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APPENDIX A: INSPECTION REPORT

Iowa Department of Transportation

Office of Bridge and Structures
Bridge Maintenance and Inspection Unit

Bridge Condition Report

Bridge ID: 8550.2R030 NBI Number: 48730

District: 1 Inspection Group: Team 1

Inspection Type: In-Depth and Fracture Critical

Inspection Date: In-Depth: 10/01/2012 Frac Crit: 10/01/2012

Carrying: EB US 30 over SOUTH SKUNK RIVER

Location: 1.2 MI. W OF JCT. I-35

Approved By: Olson, Paul

SIIMS

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BRIDGE DESCRIPTION

This is a 325' x 30' Steel Girder bridge, constructed in 1963, carrying eastbound U.S. 30 over South Skunk River and located 1.2 miles west of junction of I-35.

WATERWAY

Upstream, the waterway is reasonably straight and skewed about 30 degrees right ahead for about 600 ft. and then it meanders towards the far side. Flow is from left to right. The bridge is skewed 20 degrees right ahead. A welded wire retard protects the near upstream bank for about 700 feet. The far bank was lined with rip-rap sometime between the 2002 and 2004 inspections.

SUBSTRUCTURE

Both abutments are stub concrete and the two piers are solid concrete. The abutments are supported on treated wood friction piling and the piers are supported on untreated wood friction piling. The bearings over Pier 1 are fixed. The other bearings are rockers. The abutments were sealed with epoxy in 1996.

SUPERSTRUCTURE

This is a fracture critical three span continuous steel welded two girder structure. This type of superstructure is vulnerable to fatigue cracking caused by out-of-plane bending. The bridge was retrofitted in 1982. The gusset plate connections to the floor beam over both abutments were retrofitted with bolts at the diagonal brace connections in 2000. The bridge was retrofitted again in 2012. There were 3" holes drilled at the bearing stiffener intersecting weld locations at Piers 1 and 2.

ROADWAY

The deck is PC concrete overlaid with dense low-slump concrete in 1985.

APPROACHES

Both approaches are paved with PC concrete and overlaid with asphalt concrete, except for a section of PC concrete next to the bridge.

FHWA Number: 48730 Bridge ID.: 8550.2R030

Deck

Item	Description	Condition	Comments
Deck Overall:	NBI Item 58	6 - Satisfactory Condition (minor deterioration)	
Deck Drains:	Plastic Extension	Good	
Curb Type - Left:	Curb with retro rail	Good	
Curb Type - Right:	Curb with retro rail	Good	
Cantilevered Curb:	Yes	Good	
Bottom of deck has or has had delaminated concrete over traffic:		No	
Left Bridge Rail:	Vertical Concrete Parapet		
Right Bridge Rail:	Vertical Concrete Parapet		

Near

Item	Description	Condition	Comments
Approach:	Concrete	Good	EF joint is > 2" at at 60 degrees F, 100 ft. from the deck.
Left:			
Guardrail Ends:	End Terminals - FLEAT	Poor	Horizontal tear > 1/2" wide; loose anchor cable.
Approach Guardrail:	W/beams W/square posts	Poor	
Guardrail Transition:	Thrie-beam - 7 bolts thru	Good	
Right:			
Guardrail Ends:	End Terminals - FLEAT	Poor	Horizontal tear > 12" long; loose anchor cable.
Approach Guardrail:	W/Beams W/Square Posts	Poor	
Guardrail Transition:	Thrie-beam - 7 bolts thru	Good	

Far

Item	Description	Condition	Comments
Approach:	Concrete	Good	EF joint is < 2" at 60 degrees F, 65 feet from the deck.
Left:			
Guardrail Ends:	End Terminals - FLEAT	Poor	Loose anchor cable.
Approach Guardrail:	W/Beams W/Square Posts	Good	
Guardrail Transition:	Thrie-beam - 7 bolts thru	Good	
Right:			
Guardrail Ends:	None	N/A	
Approach Guardrail:	None	N/A	
Guardrail Transition:	None	N/A	

FHWA Number: 48730

Bridge ID.: 8560.2R030

Superstructure

Item	Description	Condition	Comments
Superstructure Overall:	NBI Item 59	5 - Fair Condition (minor section loss)	There are confirmed fatigue cracks.
Additional Structure Details:	Two girder Welded I Girder W/ floor beams		

Beams / Girders

Item	Number	Description	Condition	Comments
Concrete Girders - Interior:		None	N/A	
Beam End Deterioration: ☐	No. of beam end deteriorated:			
Concrete Girders - Exterior:		None	N/A	
Beam End Deterioration: ☐	No. of beam end deteriorated:			
Steel Beam - Interior:	6	Welded	Good	Stringers 1 and 2.
Beam End Deterioration: ☐	No. of beam end deteriorated:			
Steel Beam - Exterior:	6	Welded	Fair	Girders 1 and 2.
Beam End Deterioration: ☐	No. of beam end deteriorated:			

Diaphragms

Item	Description	Condition	Comments
End Diaphragm Type:	Rolled Steel	Fair	
Intermediate Diaphragm Type:	Miscellaneous	Good	

Fracture Critical / Fatigue Vulnerable / Retrofit Members

Item	Yes/No	Members		
Fracture Critical:	Yes	☑ Girder	☐ Pier Girder	☐ Tie Girder
		☐ Cross Girder	☐ Suspension Cable	☐ Truss Member
		☐ Cable Stayed Girder	☑ Floor Beam	☐ Other
Fatigue Vulnerable:	Yes	☐ Diaphragm Connection	☐ Welded Cover	☐ Blast Plate
		☑ Floor Beam Connection	☐ Plug Welded Hole	☐ Collision Damage
		☐ Gusset Plate	☐ Longitudinal Stiffeners	☐ Other
Retrofit:	Yes	☐ Loosening Diaphragm Bolts	☑ Large Cored Hole	☑ Conn. Plate Cutback
		☐ Bolt to Flange	☐ Bolted Splice	☐ Other

Fatigue Inspection History

	Current Inspection	Next Inspection	
Fatigue Inspection Date	10/15/2012	10/15/2014	☐ Six Year Cycle
Number of locations with previous confirmed cracks	2		
Number of locations with new confirmed cracks	0		
Number of locations with cracks extended beyond holes	0		
Total number of locations with confirmed cracks	2		

Have holes been drilled at all cracks?	Y

Pin and Hangar Assemblies

	Yes/No	Ultrasonic Inspection Date	Next Ultrasonic Inspection Date
Pin and Hangar assemblies	No		

FHWA Number: 48730 | Bridge ID.: 8550.2R030

Substructure

Item	Description	Condition	Comments
Substructure Overall:	NBI Item 60	5 - Fair Condition (minor section loss)	There are spalled and hollow areas.

Foundations

Item	Description	Condition	Comments
Near Abutment Foundation:	Timber bearing pile	Unknown	
Far Abutment Foundation:	Timber bearing pile	Unknown	

Berm Protection

Item	Description	Condition	Comments
Near Berm Protection:	No Protection	Fair	There is moderate erosion on the near berm.
Far Berm Protection:	Rip-Rap	Good	

FHWA Number: 48730 | Bridge ID.: 8550.2R030

Channel

Item	Description	Condition	Comments
Channel Overall:	NBI Item 61	7 - Bank protection needs minor repairs	

Bank Protection/Revetment

Item	Description	Condition	Comments
Upstream Bank Protection:	Steel Pile/Fence	Good	Attached to Pier 1 on the "Left" bridge and extends about 700 ft. upstream on the near bank.
Downstream Bank Protection:	Rip-Rap	Good	The far bank was lined with rip-rap sometime between the 2002 and 2004 inspections.
Bridge Revetment:			

NBI Item 113 Scour Critical Bridges: 5 - Stable - Within Limits

Scour Critical Classification:

Underwater Inspection

Underwater Inspection By Divers: No | Streambed: No

No. of Piers To Be Inspected: 0

Waterway Characteristics

Reference Point:	884.6 Low steel pier #2	High Water Elev.:	883.0	Current Water Elev.:	866.4 (18.2)
Pile Tip Elev.:	826.0	Low Water Elev.:	866.4	Current Streambed Elev.:	866.4
Pile Length:	35 ft.	Scour Hole Elev.:			
Plan Streambed Elev.:	866.0				

Waterway Inspection: (Not applicable for culverts)

Item No.	Yes, No, NA or Not Visible	Description
1.	No	Is there a significant build-up of debris?
2.	No	Is there a change in the horizontal alignment of the handrail or structure members such as beams?
3.	No	Is there any indication of vertical movement of the superstructure?
4.	No	Is there shifting of the channel alignment or erosion of the stream banks? Also are there cracks in the soil of the banks parallel to the stream?
5.	No	Is there a significant change in the alignment of hte exterior bearings?
6.	No	Are there cracks or other signs of distress in the approach pavement?
7.	No	Is the water currently on the superstructure?
8.	No	Are the berm slopes steeper than 2:1 from the toe of the scour to the roadway?
9.	No	Do scour measurements indicate: (place a check by all that apply.)

- ☐ A. that the streamed is two or more feet below the bottom of pier footings which are supported on piles?
- ☐ B. scour below the bottom of spread footings?

- [ ] C. scour below the bottom of high abutment footings?
- [ ] D. that the streambed has scoured five feet or more below the original streambed elevation at pier bents?

If Scour Critical Classification is Armored or Permanent, refer to the Bridge Specific Provisions, Appendix B, for specific countermeasures installed at the bridge site. The inspection should verify that the countermeasures are substantially intact and appear to still be functional.

10. No ______ Have the countermeasures been damaged or otherwise made ineffective?

Note:

Streambed sounding data is to be documented.

A streambed profile should be done on the upstreamside of all bridges. If Item #9 is yes, then a profile on the downstream side of the bridge should also be done in the scoured area. If the downstream profile also indicates a problem, then soundings should be made under the bridge if possible.

If "yes" is the answer to any items on the checklist, contact the office for furthur instructions.

Comments:

Completed On ______________________________ By ____

Piers

Pier 1

Foundation Description	Timber Bearing Pile
Foundation Condition	Unknown

Foundation Comments

Pier Description	Solid Pier, Pier Wall or Shaft of a T-Pier
Pier Condition	Good

Pier Comments

Pier 2

Foundation Description	Timber Bearing Pile
Foundation Condition	Unknown

Foundation Comments

Pier Description	Solid Pier, Pier Wall or Shaft of a T-Pier
Pier Condition	Good

Pier Comments

Structure Inventory and Appraisal

Bridge ID: 8550.2R030	Official	SR: 56.4	SD/FO: Not Deficient or Obsolete
FHWA No.: 48730	Unofficial	SR: 57.9	SD/FO: Not Deficient or Obsolete

IDENTIFICATION

7 Facility Carried:	EB US 30
5B Rte. Signing Prefix:	2
5C Level of Service:	1 - MAINLINE
5D Inventory Route:	00030
City:	AMES
3 County:	085 - Story
9 Location:	1.2 MI. W OF JCT. I-35
5E Directional Suffix:	0 - NOT APPLICABLE
6 Feature Intersected:	SOUTH SKUNK RIVER
2 District:	1
Garage:	1602
98 Border Bridge Code:	
% Responsibility:	0
99 Border Bridge No.:	

STRUCTURE TYPE AND MATERIALS

43A Main Span	4 - Steel Continuous
43B Main Span Design:	03 - Girder and Floorbeam System
45 No. Spans Main Unit:	3
44A Appr. Span	000 - NA
44B Appr. Span Design:	000 - NA
46 No. of Appr. Spans:	Near 0 Far 0
107 Deck Type:	1 - Concrete Cast-in-Place
108A Wearing Surface:	4 - Low Slump Concrete
108B Membrane:	0 - None
108C Deck Protection:	4 - Cathodic Protection

GEOMETRIC DATA

48 Length Max Span:	125 ft.
49 Structure Length:	325 ft.
34 Skew:	20°
Deck Area:	11700.0 sq. ft.
50B Curb/Sdwk Width R:	0.0 ft.
50A Curb/Sdwk Width L:	0.0 ft.
51 Width Curb to Curb:	30 ft.
52 Width Out to Out:	36.0 ft.
32 Appr. Roadway width: (w/ Shoulders)	40 ft.
33 Median:	1 - Open median
35 Structure Flared:	00 - No flare
10 Vertical Clearance:	99'99"
47 Horiz. Clearance:	30'1"
53 Min. Vert. Clearance Over:	99'99"
54B Min. Vert. Underclearance:	00'00"
55 Min. Lat. Underclearance R:	00'00"
56 Min. Lat. Underclearance L:	00'00"

NAVIGATION DATA

38 Navigation Control:
0 - No navigation control on waterway (bridge permit not required)

111 Pier Protection:	
39 Vertical Clearance:	00'00"
40 Horiz. Clearance:	000'00"

16 Latitude: 42.00605075 17 Longitude: -93.59453344

FRA No. (if RR Bridge):	
Mile Post:	150.2

INSPECTION

90 Inspection Date:	10/01/2012	Inspection Type:	In-Depth and Fracture Critical
Next Routine Insp Date:	10/04/2013	91 Frequency:	24
		Next Insp Type:	Other Special
Inspection Agency:	1 - IADOT	Inspection Group:	Team 1
93A FC Inspection Date:	10/01/2012		
92A FC Frequency:	24	Next FC Insp.:	10/01/2014
93B UW Inspection Date:			
92B UW Frequency:		Next UW Insp.:	NA
93C SI Date:	10/04/2011		
92C SI Frequency:	24	Next Spec. Insp.:	10/04/2013
Other Non-NBI Date:			
Other Non-NBI Freq.:		Next Other Insp.:	NA

CONDITION

58 Deck:	6 - Satisfactory Condition (minor deterioration)
59 Super:	5 - Fair Condition (minor section loss)
60 Sub:	5 - Fair Condition (minor section loss)
61 Channel/Channel Prot.:	7 - Bank protection needs minor repairs
62 Culvert:	N - Not Applicable

APPRAISAL

67 Str. Evaluation:	5 - Somewhat better than minimum adequacy
68 Deck Geometry:	4 - Meets minimum tolerable limits
69 Underclear Vert & Horiz:	N - Not applicable
71 Waterway Adequacy:	6 - Occasional Overtopping of Approaches
72 Approach Alignment:	8 - Equal to present desirable criteria
36A Bridge Rail:	1 - MEETS CURRENT SAFETY STANDARDS.
36B Transition:	1 - MEETS CURRENT SAFETY STANDARDS.
36C Approach Rail:	1 - MEETS CURRENT SAFETY STANDARDS.
36D Approach Rail Ends:	1 - MEETS CURRENT SAFETY STANDARDS.
113 Scour Critical:	5 - Stable - Within Limits

LOAD RATING AND POSTING

31 Design Load:	5 - HS 20
63 Rating Method:	1 - Load Factor (LF) reported in english tons using HS-20 loading.
64 Operating Rating:	39.7 Tons
65 Rating Method:	1 - Load Factor (LF) reported in english tons using HS-20 loading.
66 Inventory Rating:	23.8 Tons
70 Posting:	5 - Equal to or above legal loads
41 Posting Status:	A - Open

AGE AND SERVICE

27 Year Built:	1963	Design No.:	3061
106 Year Reconstructed:	0		
42A Type of Service on:	1 - Highway		
42B Type of Service Under:	5 - Waterway		
28A Lanes on:	2	28B Lanes under:	0
29 ADT:	14750	30 Year of ADT:	2011
109 Truck ADT:	6 %	Speed Limit:	65
19 Detour Length:	1 mi.		

CLASSIFICATION

112 NBIS Length:	Y
26 Functional Class:	14 - Urban - Other Principal Arterial
100 STRAHNET:	0 - Not a defense highway
101 Parallel Structure:	R - Right structure (North or East)
102 Direction of Traffic:	1 - 1-way traffic
22 Owner:	01 - State Highway Agency
21 Custodian:	01 - State Highway Agency
37 Historical Significance:	5 - Not eligible
75A Type of Work Proposed:	
75B Work Done by:	

Channel Section

Custom Label	Distance From End of Bridge	Measurement Depth

Date of Cross Section:

Distance Measured From:

Depth Measured From:

Comments:

Iowa Department of Transportation
Form 532043 (12-09)

Critical Finding

Part I (To be completed by inspector or owner)

Bridge ID	FHWA No.	Facility Carried	Feature Intersected
8550.2R030	48730	EB US 30	SOUTH SKUNK RIVER

Critical Finding Date	Report Date	Inspector's Name	Bridge Owner
			01

Reason for Report: ☐ Collapse ☐ Structural Damage ☐ Structural Failure ☐ Approach Failure ☐ Delaminated Concrete over Traffic ☐ Bridge Hit

Location of Finding: ☐ Deck ☐ Superstructure ☐ Substructure ☐ Approaches ☐ Piles ☐ Railing ☐ Other

Immediate Action Taken: ☐ Close Bridge ☐ Close Lane ☐ Other

Description of Critical Finding: (attach Photos)

Part II (To be completed by owner)

Reviewed by	Title	Date Part II Completed

Resolution: ☐ Close Bridge ☐ Close Lane ☐ Load Posting ☐ Repair ☐ Other

Owner's Anticipated Plan for the Bridge: (Repair, Replace, Remove, Permanently Close, Load Post, etc.)

Note: Before a bridge may be reopened to traffic, a licensed engineer must approve any structural repairs, the bridge must be load rated and the bridge must be inspected.

Bridge Load Rating Report

FHWA # (Item 8): 48730 Report By: Scott Neubauer Date: 05/24/2011

Bridge ID: 8550.2R030 Year Built (Item 27): 1963 Year Reconstructed (Item 106): 0

Width C-C: 30 Width O-O: 36.0 Bridge Structure Type (Item 43): 403

Feature Intersected (Item 6): SOUTH SKUNK RIVER

STRUCTURAL INVENTORY AND APPRAISAL:

Design Load (Item 31): 5 - HS 20 Lanes: 2

Operating Rating (Item 64): 39.7 Tons/RF Rating Method (Item 63): 1

Operating Rating is controlled by: Negative bending critical location 3.0 point of stringers

Inventory Rating (Item 66): 23.8 Tons/RF Rating Method (Item 65): 1

Inventory Rating is controlled by: Negative bending critical location 3.0 point of stringers

Comment: Updated to LF.

☐ (Calculations attached)

Deck (Item 58): 6 Superstructure (Item 59): 5 Substructure (Item 60): 5 Culvert (Item 62): N

Bridge Posting (Item 70): 5

Load Rating Table									Recommended Posting
Load Type	One Lane Traffic				Two Lane Traffic				
	Type	Tons	Type	Tons	Type	Tons	Type	Tons	Tons
Straight Truck	4		3		4		3		
Truck - Semi-trailer	3S3		3S2		3S3		3S2		
Truck - Full-trailer	3-3		SU7		3-3		SU7		
Triple Axle Group	4or4S3		3S3orB		4or4S3		3S3orB		

Permit Vehicle Adequacy: 90K: Yes 136K A: Yes 136K B: Yes 156K: Yes

STRUCTURAL RATING

I hereby certify that this engineering document was prepared by me or under my direct personal supervision and I am duly licensed Professional Engineer under the laws of the State of Iowa.

Signature ______________________ Date 05/24/2011

Scott Neubauer
Printed or Typed Name

License No.: 14656 My license renewal date is December 31, 2012

Comments:

Load Rating Evaluation Form

Name: Todsen

Date: 12/21/2011

Bridge ID: 8550.2R030

County / City: Story County / AMES

FHWA No.: 48730

ADT: 14750

Main Span Materials & Design (Item 43): 403

Location: 1.2 MI. W OF JCT. I-35

The purpose of this evaluation form is to determine if the condition and configuration of the structure is still consistent with the load rating calculations that were completed during a previous bridge inspection. If the answer to all of these evaluation items is "No" then recalculation is not required. IF the answer to any of these evaluation items is "Yes", a Professional Engineer, licensed in the State of Iowa, must evaluate if re-calculation of the load ratings for this structure is required. Answer "No" or "Yes" to the following.

	No	Yes
Was the bridge re-rated as part of this inspection? If no, check the following criteria. If yes, no additional information is needed.	☑	☐
If any of the following criteria are "Yes", the bridge shall be load rated:		
1. The bridge is new.	☑	☐
2. The bridge has undergone a major rehabilitation that affects the controlling structural element. This may include the deck, superstructure, or substructure elements.	☑	☐
3. Item 58, Deck; Item 59, Superstructure; Item 60, Substructure; or Item 62, Culvert; coding decreased to 3 or less.	☑	☐
4. Moderate to significant changes to the superstructure dead load occurred. This may include the addition of an overlay or changes of 2 or more inches of overburden such as earth or rock since the previous rating.	☑	☐
5. Lateral support of the beams changed.	☑	☐
6. Five feet or more of scour/erosion occurred at the foundations due to flooding events or progressive down cutting. If "yes", the bridge shall be evaluated for structural capacity of the foundations.	☑	☐
If any of the following criteria are "Yes", the bridge shall be considered for re-load rating:		
1. Item 58, Deck; Item 59, Superstructure; Item 60, Substructure; or Item 62, Culvert; coding decreased to 4.	☑	☐
2. New information found during the most recent field inspection affects load capacity.	☑	☐
3. Additional investigation, testing, or analysis was done and found issues that may affect load capacity.	☑	☐
4. Item 63 and 65, Rating Method, is coded 5.	☑	☐
Does the bridge need to be re-rated? If yes, re-rate the bridge and update the Bridge Load Rating Report.	☑	☐

Program Manager Signature: ______________________

Printed name of Program Manager: ______________________

Iowa Department of Transportation

SUPPLEMENTARY INSPECTION INFORMATION

Bridge ID.: 8550.2R030

FHWA No.: 48730

Traffic Control Required: ________ Comments:

Equipment Requirements: ☐ Life Jacket ☐ Full Body Harness ☐ Ladder ☐ Boat ☐ Gas Monitor

☐ Probing Rod ☐ Chain Drag ☐ Manlift ☐ Snooper

☐ Non-destructive Testing Equipment Comments:

Crew Hours: ________ Flagger Hours ________ Helper Hours: ________

Snooper Hours: ________ Special Crew Hours: ________ Special Equipment Hours: ________

Completed On: ________ By: ________

Original Design Number(s)

Year	Design Number	Comments
1963	3061	

Bridge Repairs

Year	Design Number	Type	Comments
1982	781	Fatigue Crack Retrofit and/or Repair	
1985	684	Barrier Railing	
1985	684	Original Deck Overlay	

Pictures

NBI Number:	48730	Bridge ID:	8550.2R030
Facility Carried:	EB US 30	Feature(s) Intersected:	SOUTH SKUNK RIVER

Sketches

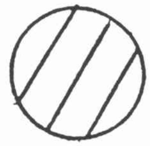
NBI Number:	48730	Bridge ID:	8550.2R030
Facility Carried:	EB US 30	Feature(s) Intersected:	SOUTH SKUNK RIVER

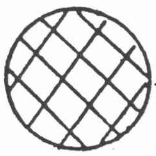
m 810040
3

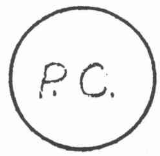
Scale	Bridge No. 8550.2R035	Sketch by	Date	Page
	Sketch of: Legends	D.G.B.	5-19-98	B-1
		TEAM #1	3-27-00	
		Team #1	7-11-02	
		Team 1	11-9-04	
		TEAM #1	10-4-06	
		Team #1	10-7-10	

NOTE: Cracks Are Hairline Unless Otherwise Noted


-Scale L- light M- moderate S- severe


-Hollow


-Spall



-P.C. Patch

-A.C. Patch

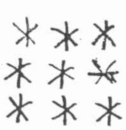
-Injected Epoxy


-Leaching

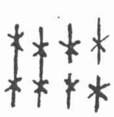

-Staining


-Pattern Cracking


-Map Cracking


- Random Cracking


- Stalactites


-Exposed Reinforcing

X - Bearing location

Form 810040
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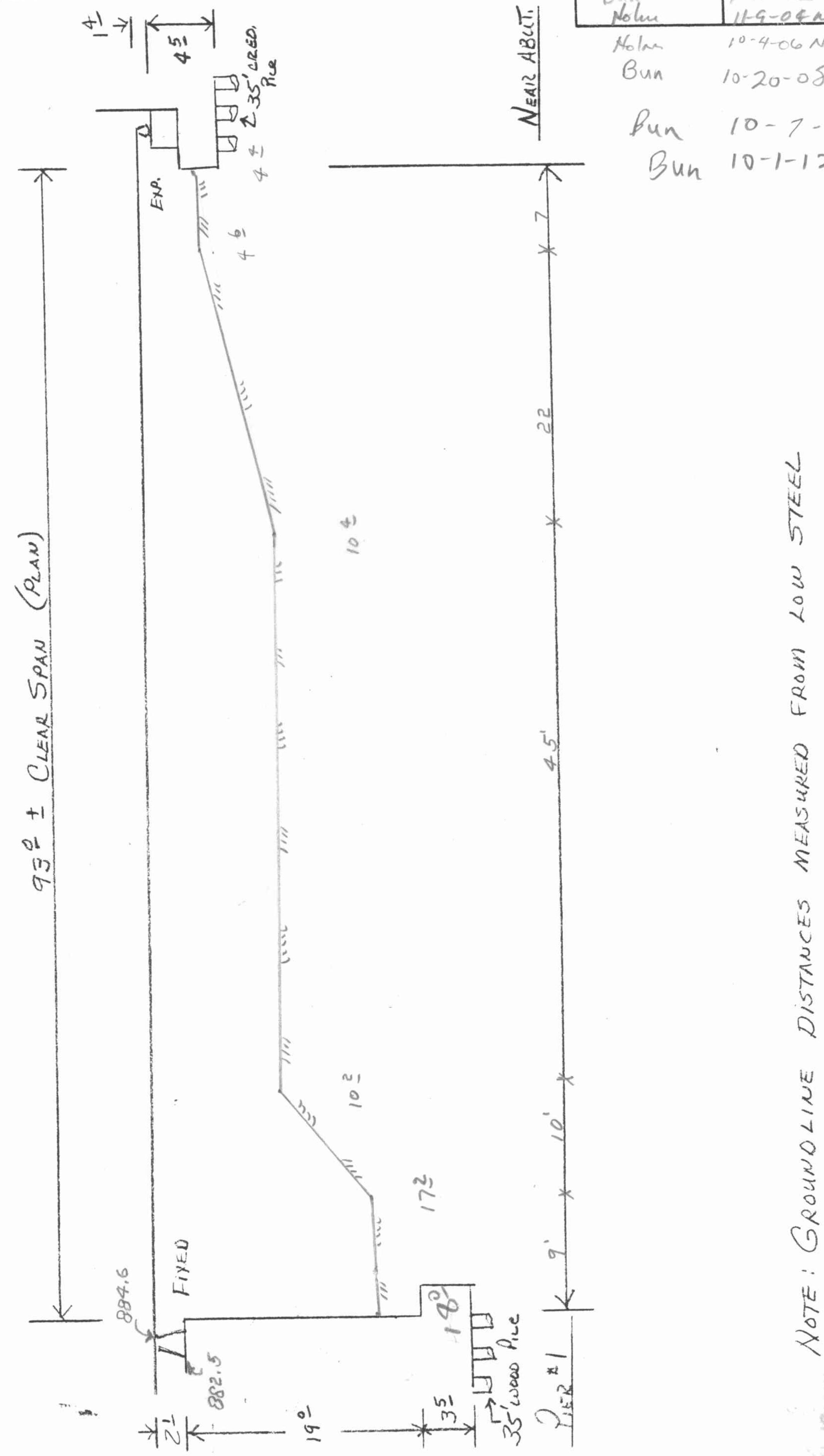
Scale	Bridge No. 8550.2 B 030	Sketch by	Date	Page
120	Sketch of: LT. PROFILE – SPAN #1	TEAM'1	3-29-00	B.-2
		Bun	7-11-02 N.C	
		Holm	11-9-04 AAW	

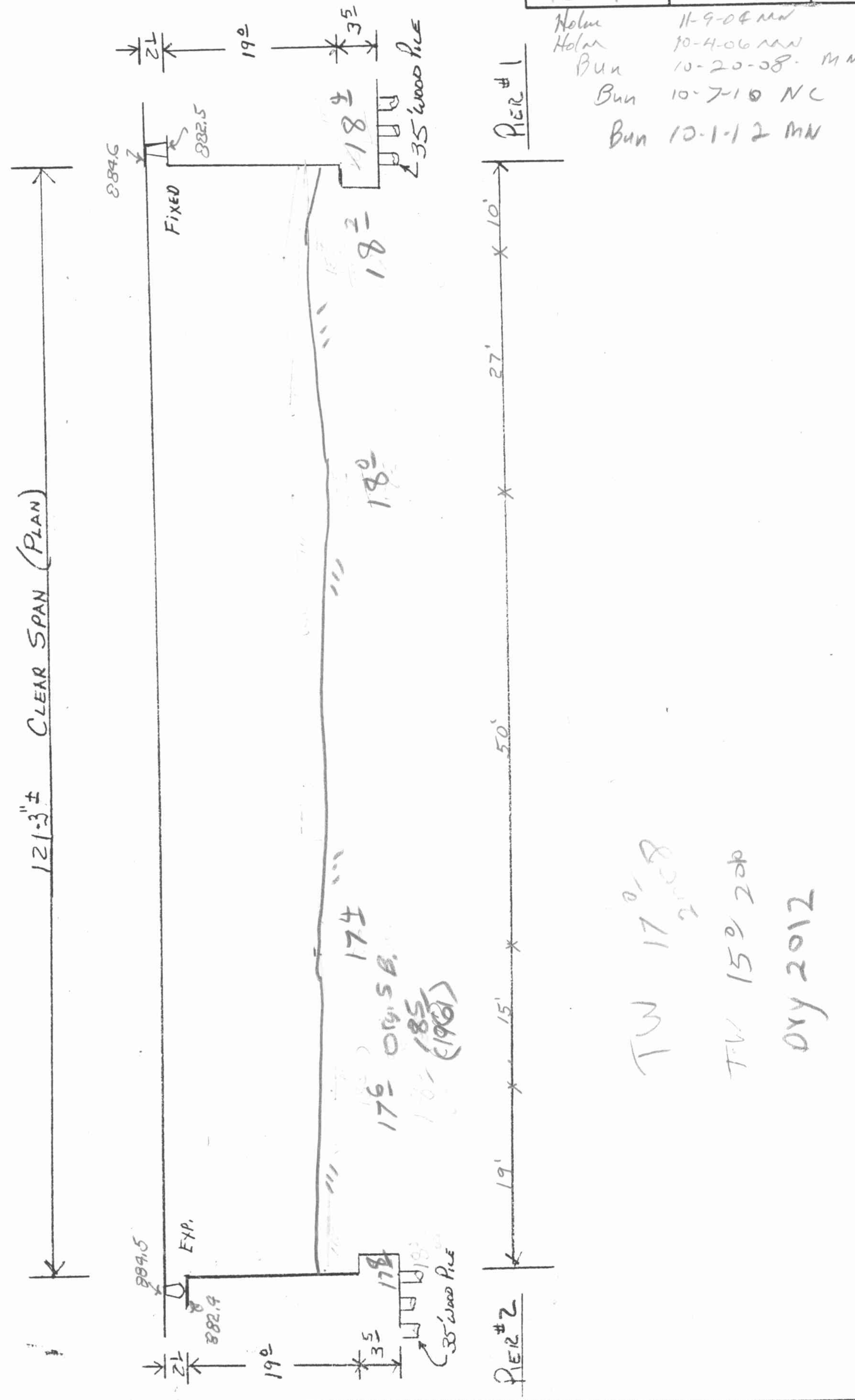
Holm 10-4-06 AAW
Bun 10-20-08 NC
Bun 10-7-10
Bun 10-1-12 NC



Form 810040
6-77

Scale	Bridge No. 8550.2 R 030	Sketch by	Date	Page
160	Sketch of: LT. PROFILE - SPAN #2	TEAM 1	3-29-00	B-3
		TEAM #1	7-11-02	

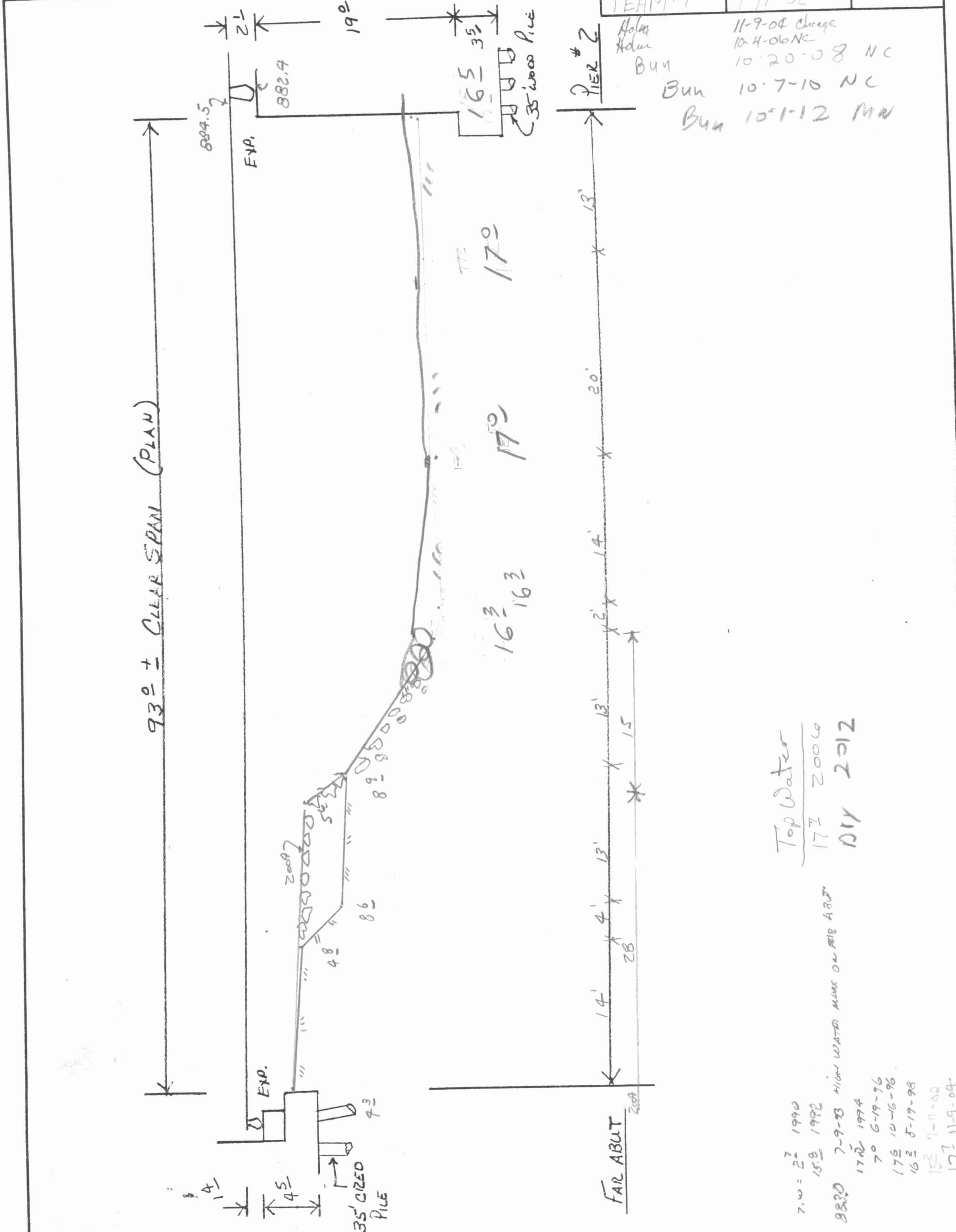
Holm 11-9-04 MN
Holm 10-4-06 MN
Bun 10-20-08 MN
Bun 10-7-10 NC
Bun 10-1-12 MN



Form 810040
6-77

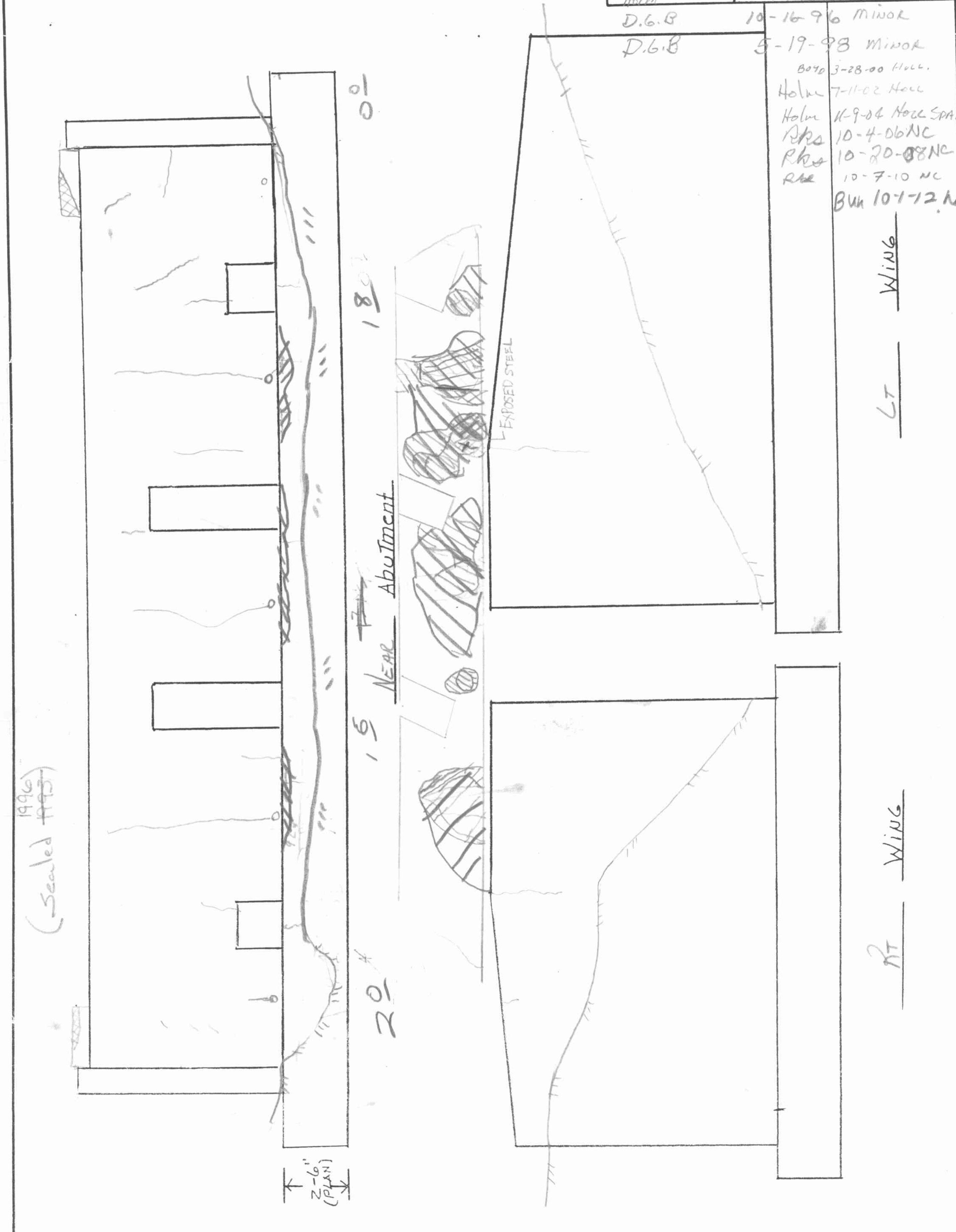
Scale	Bridge No. 8550.2 R 030	Sketch by	Date	Page
120	Sketch of: LT. PROFILE - SPAN # 3	TEAM #1	3-29-00	B-4
		TEAM #1	4-11-02	

Holm 11-9-04 change
Holm 10-4-06 NC
Bun 10-20-08 NC
Bun 10-7-10 NC
Bun 10-1-12 MN



Form 810040
6-77

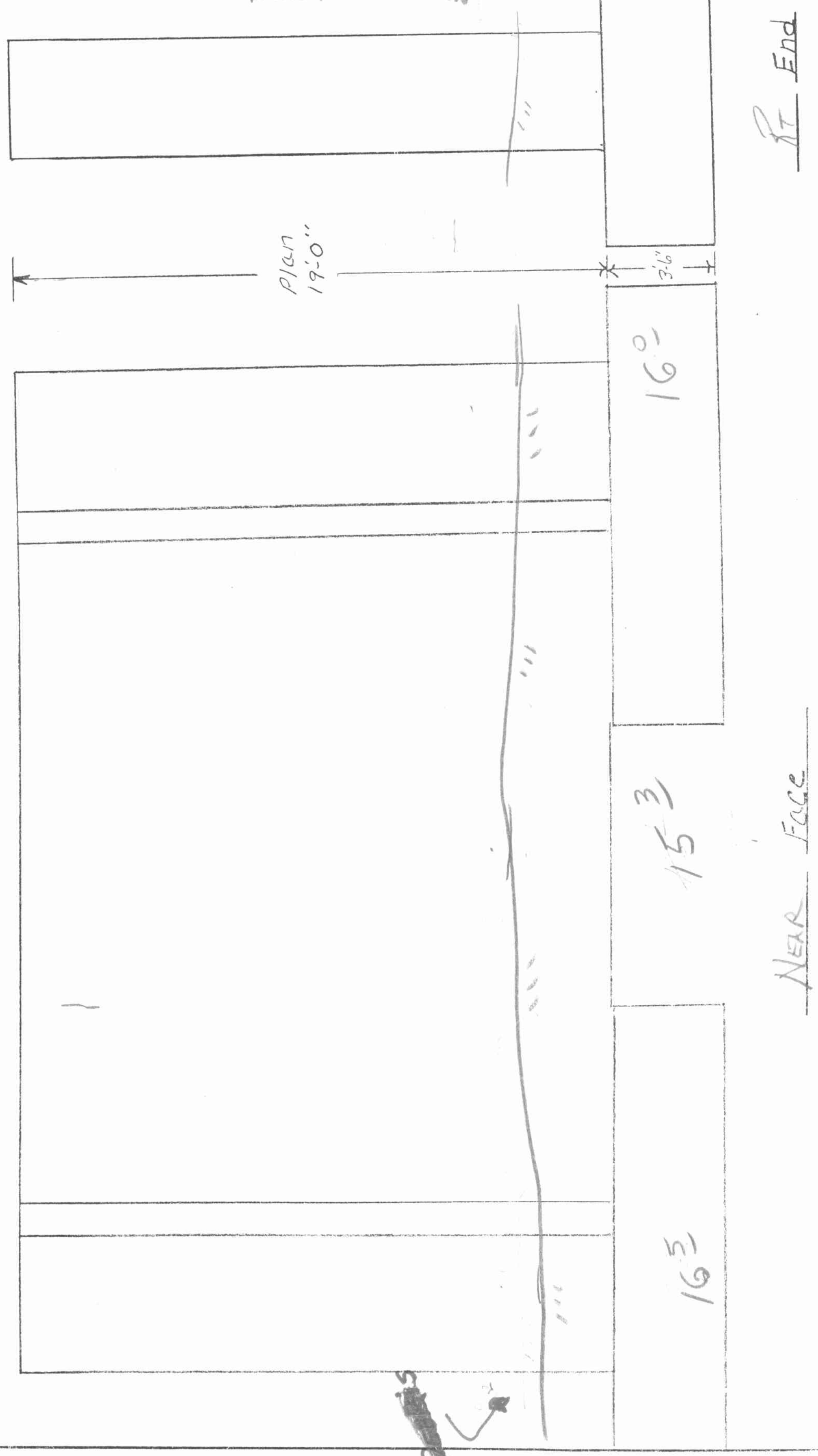
Scale	Bridge No. 8550.2R030	Sketch by	Date	Page
50	Sketch of: Abutment & Wingwall (Near)	Holm	Spall 9-4-90	B-5
		Holm	11-10-92 Br. Seal	
		Holm	8-29-94 Min	
		D.G.B	10-16-96 Minor	
		D.G.B	5-19-98 Minor	
		Boyd	3-28-00 Holl.	
		Holm	7-11-02 Holl	
		Holm	11-9-04 Holl Spall	
		Rks	10-4-06 NC	
		Rks	10-20-08 NC	
		RAR	10-7-10 NC	
		Bun	10-1-12 No...	



Form 810040
6-77

Scale	Bridge No. 8550.2R030	Sketch by	Date	Page
50	Sketch of: Pier No 1 Near Face	D.G.B.	5-20-98	B-6
	Holm 10-4-06 MN	Boyd Bun	3-28-00 G.L. 7-11-02 N.C	

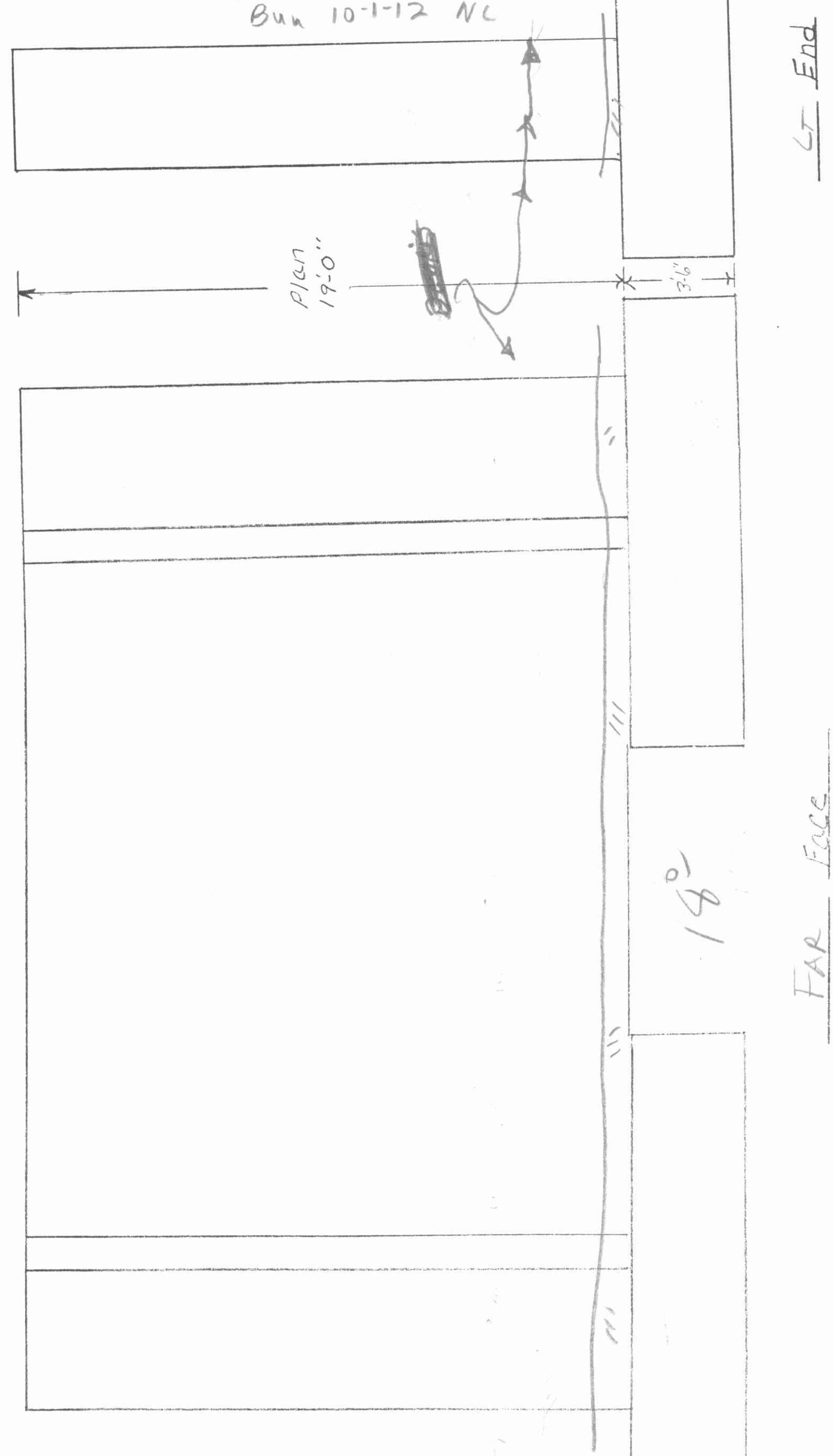
Bun 10-7-10 NC
Bun 10-1-12 MN
Holm
R/s
11-6-04 NC
10-20-08 NC



Form 810040
6-77

Scale	Bridge No. 8550.2 R 030	Sketch by	Date	Page
50	Sketch of: Pier No 1 Far Face	D.L.B.	5-20-98	B-7
		BOYD	3-28-00 G.L.	
		TEAM 1	11-11-02	

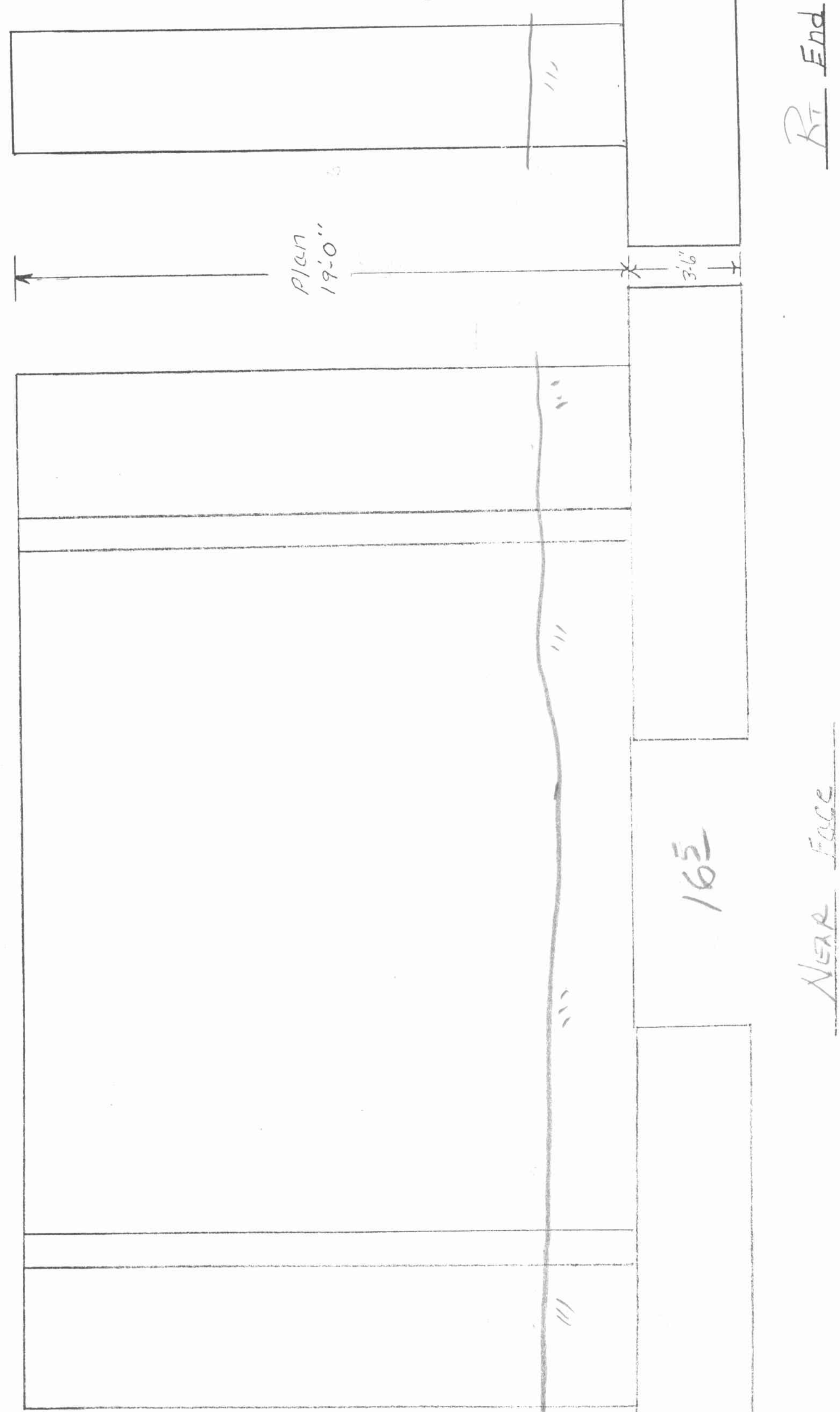
Holm 10-4-06 NN
RKs 10-20-08 NC
RKS 11-9-04 NC
Bun 10-7-10 NC
Bun 10-1-12 NC



Form 810040
6-77

Scale	Bridge No. 8550.2 R 030	Sketch by	Date	Page
50	Sketch of: Pier No 2 Near Face	D.G.B	5-20-98	B-8
		Boro / Tenn	3-28-00 / 7-11-02 N.C.	

Holm 10-11-06 NC
Bun 10-7-10 NC
Bun 10-1-13 NC
Holm 11-9-04 MW
Pkr 10-20-08 NC

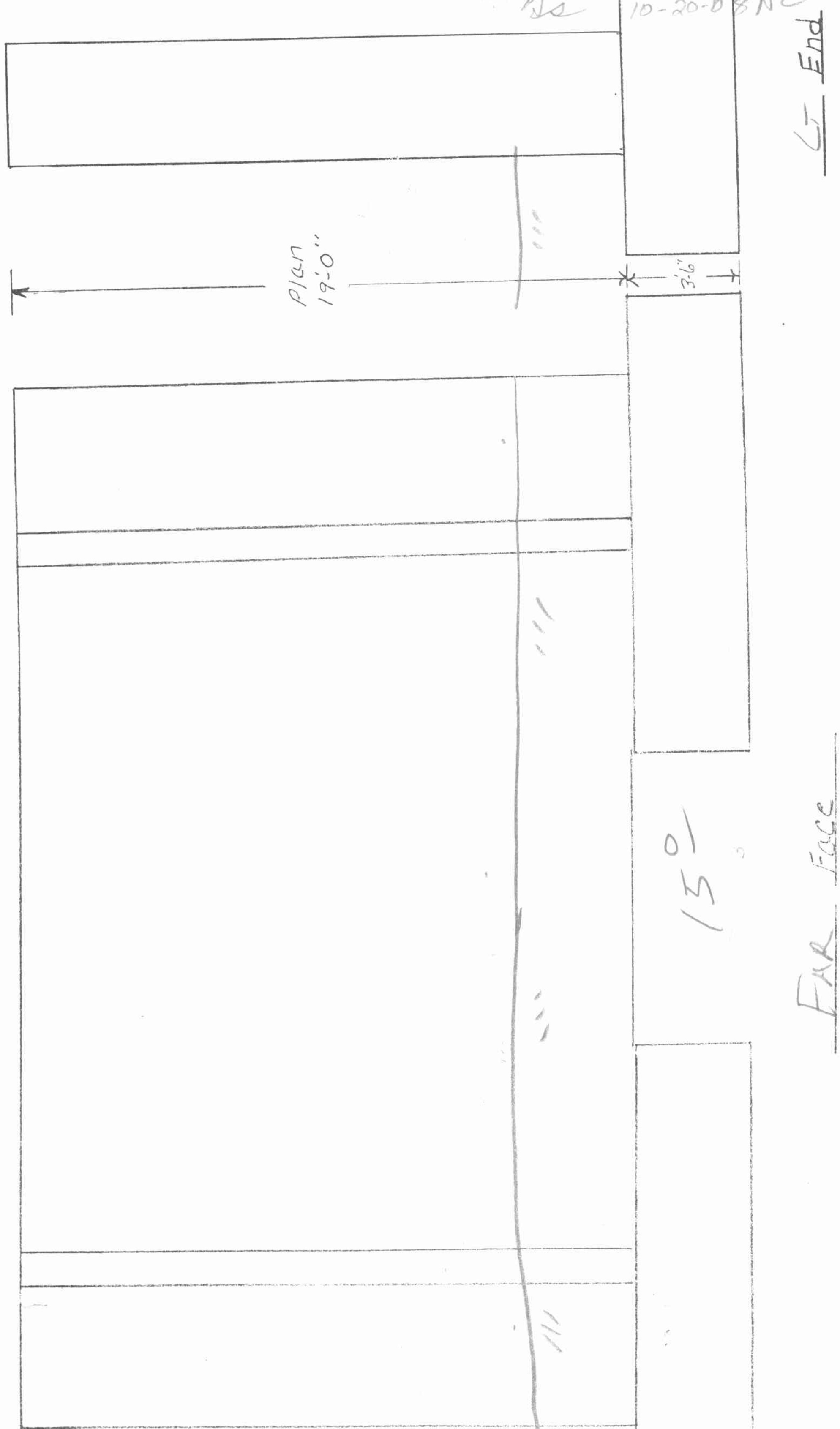


Form 810040
6-77

Scale	Bridge No. 8550.2 B 030	Sketch by	Date	Page
50	Sketch of: Pier No 2 Far Face	D.G.B.	5-20-98	B-9
		BOYD TEAM	3-28-00 G.L.	

Bun 10-7-10 NC
Bun 10-1-12 NC Holm
Holm
GS

11-9-04 MW
10-4-06 NC
10-20-08 NC

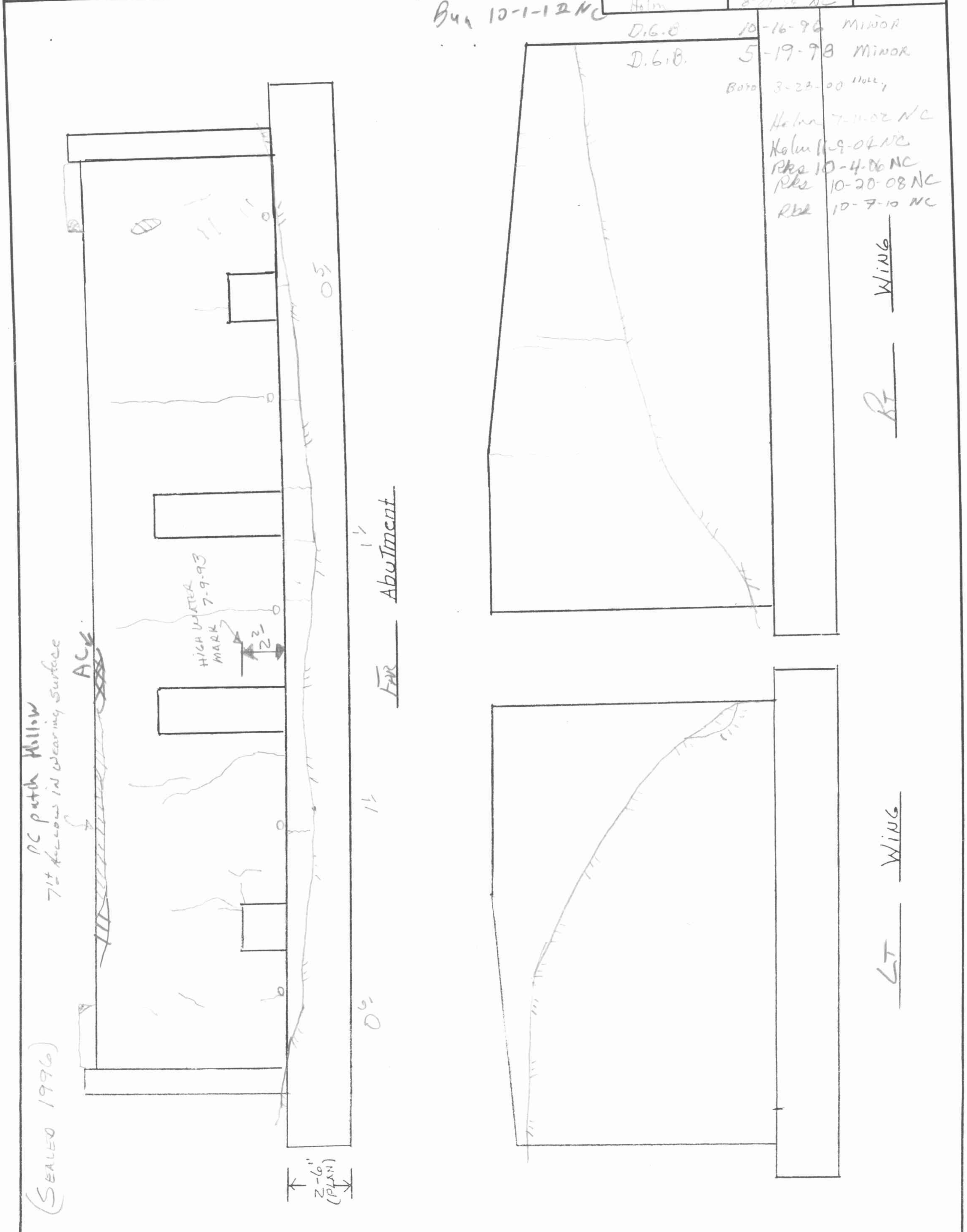


Form 810040
6-77

Scale	Bridge No. 8550.2R030	Sketch by	Date	Page
50	Sketch of: Abutment & Wingwall (FAR)	Holm	9-4-90	B-10
		Holm	11-10-92 NC	
		Holm	8-[illegible]-94 NC	

Bud 10-1-12 NC

D.G.B	10-16-96	MINOR
D.G.B.	5-19-98	MINOR
Boyd	3-23-00	Holl.
Holm	7-11-02	NC
Holm	11-9-04	NC
Pks	10-4-06	NC
Pks	10-20-08	NC
Rbk	10-7-10	NC

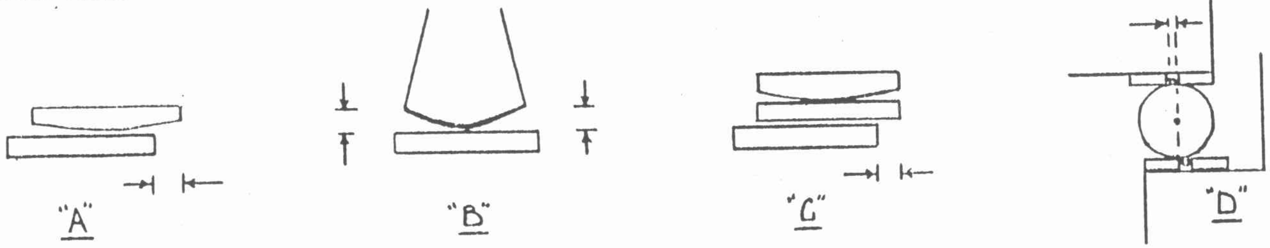


Form 810040
7-83

12

Scale	Bridge No. 8550.2R.030	Sketch by	Date	Page
NA	Sketch of: BEARING DEVICE SETTING	Holm	MN 11-9-02	B-11
		Holm	8-29-06 MN	
		D.G.B.	No change – Temp 65° 10-16-96	
		Holm	5-19-?? NC	

Bua 10-1-12 MN
Holm 7-11-02 MN
Holm 11-9-04
Holm 10-4-06 NC
RKG 10-20-08 NC
RKG 10-7-10 NC



BEARING DEVICES ARE NUMBERED LEFT TO RIGHT

2012

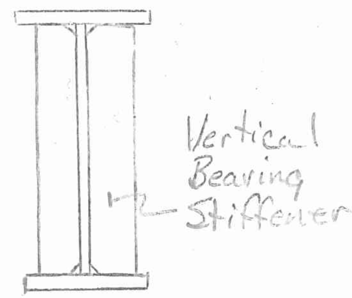
LOCATION	TYPE	No. 1 NEAR	No. 1 FAR	No. 2 NEAR	No. 2 FAR	No. 3 NEAR	No. 3 FAR	No. 4 (1) NEAR	No. 4 (1) FAR	No. 5 (2) NEAR	No. 5 (2) FAR	No. 6 NEAR	No. 6 FAR	No. 7 (1) NEAR	No. 7 (1) FAR	No. 8 (2) NEAR	No. 8 (2) FAR	No. 9 (1) NEAR	No. 9 (1) FAR	No. 10 (2) NEAR	No. 10 (2) FAR
Near Abut	"B"	1"	1 3/16	7/8	1 3/16			15/16	1 1/4	7/8	1 1/4			1 7/8	1 7/16	3/4	1 3/8	3/4"	1 1/4"	3/4"	1 1/4"
Pier #1	Fixed	-	-	-	-													Fixed			
Pier #2	"B"	2"	1 3/4	2 1/16	1 1/16			2 1/16	1 3/4	2 1/16	1 3/4			2"	1 3/4	2 1/16	1 1/16	2"	1 7/8"	2"	1 7/8
Far Abut	"B"	1 1/2	5/8"	1 9/16	3/4"			1 3/4	5/8"	1 5/8"	11/16"			1 1/8	1/2	1 1/8	1/2	1 1/2"	1/2"	1 3/8"	1/2"
		1996 - 65°						1998 - 85°						2000 - 35°							
Near Abut	"B"	15/16	1 5/16	7/8	1 5/16																
Pier #1	Fixed	-	-	-	-																
Pier #2	"B"	2"	1 1/4	2"	1 1/4																
Far Abut	"B"	1 5/8	5/8"	1 5/8"	5/8"																

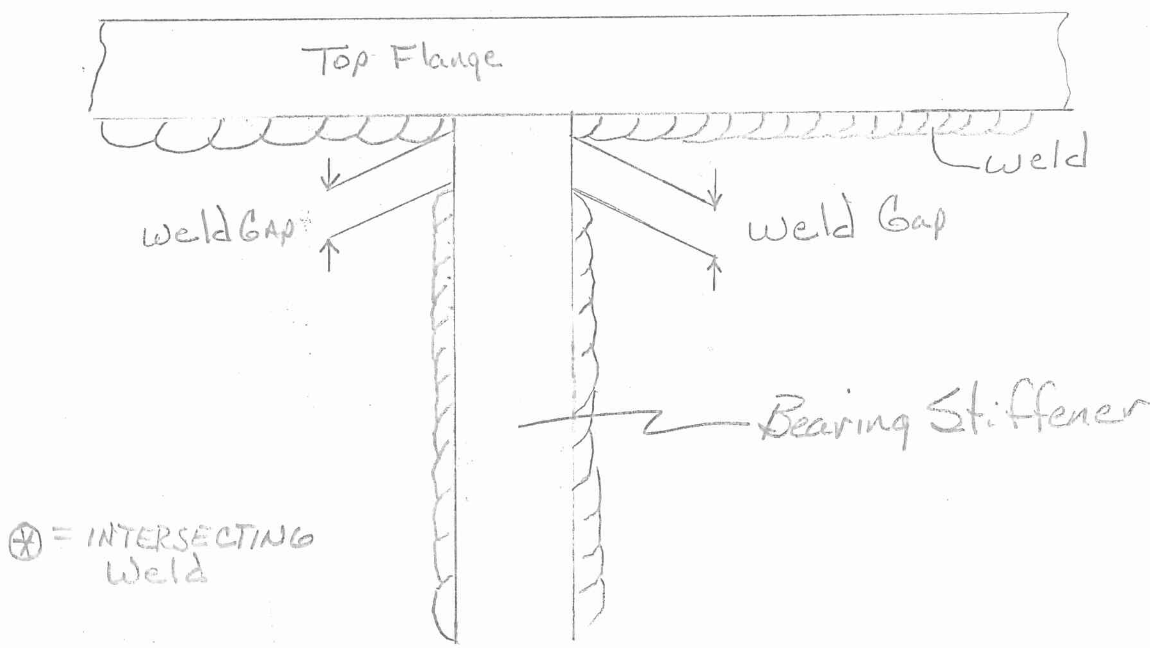
TEMP. 60°

REMARKS: Severe rust on all Brgs. 2012

Form 810040 08-01

Scale	Bridge No. 8550.2B030	Sketch by	Change since last insp.	Date	Page
	Sketch of: Bearing Stiffener Weld Gap	Bun	New	10-4-11	B- 11A
		Bun	Retrofitted	10-1-12	B-
					B-
					B-
					B-





Location		Weld Gap Interior Side		Weld Gap Exterior Side	
		Near	Far	Near	Far
Pier # 1	Left Girder	1/4	1/2	3/8	3/8
	Right Girder	1/2	1/4	1/2	3/16
Pier # 2	Left Girder	1/2	1/2	1/2	3/8
	Right Girder	1/4	1/4	1/4	1/4
Pier #	Left Girder				
	Right Girder				
Pier #	Left Girder				
	Right Girder				
Pier #	Left Girder				
	Right Girder				
Pier #	Left Girder				
	Right Girder				

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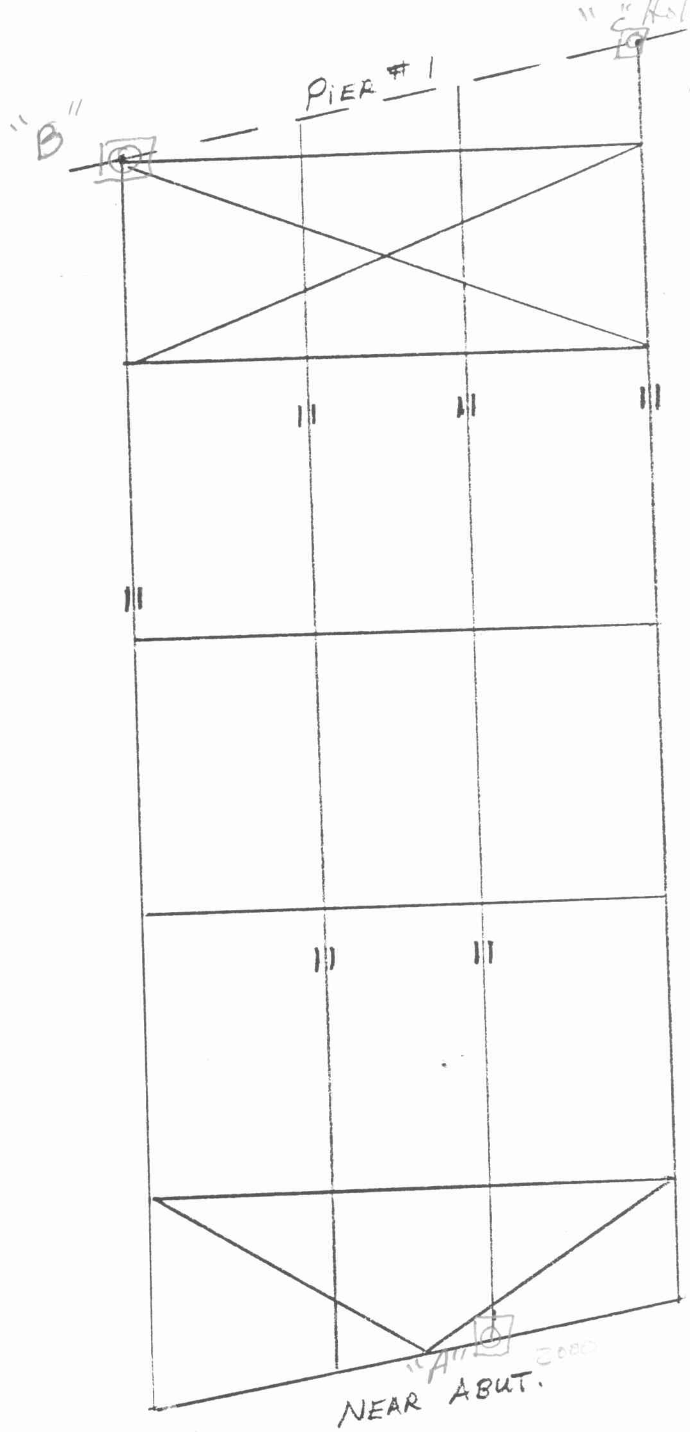
Scale	Bridge No. 8550.2 R 030	Sketch by	Date	Page
	Sketch of: STEEL LAYOUT - SPAN #1	D.G.B.	12/12/86	B-12
		D.G.B.	N.C. 6-28-88	

Holm — 8-27-90 (3 possible)
Holm — 8-29-94 (one possible)
D.G.B. — 10-16-96 (No possible cracks noted)
Holm — [illegible]
TEAM'l — 3-27-00 N.C.
Holm — 4-17-00 Holes Drilled
Holm — [illegible]
Holm — 7-11-02 NC
Bun — 11-9-04 NC
RRa — 10-4-06 NC
RRa — 10-20-08 NC
Bun — 10-7-10 NC
D.E. — 10-1-12 NC



F.B. #5

F.B. #4

F.B. #3

F.B. #2

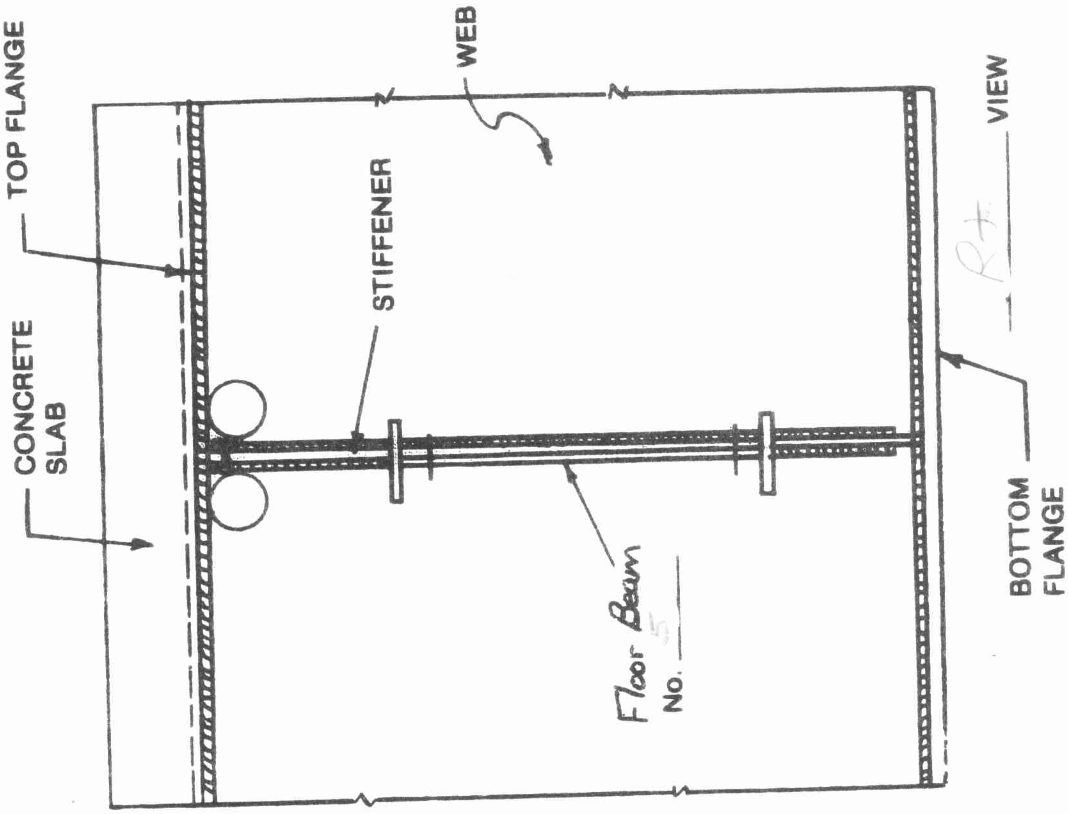
F.B. #1

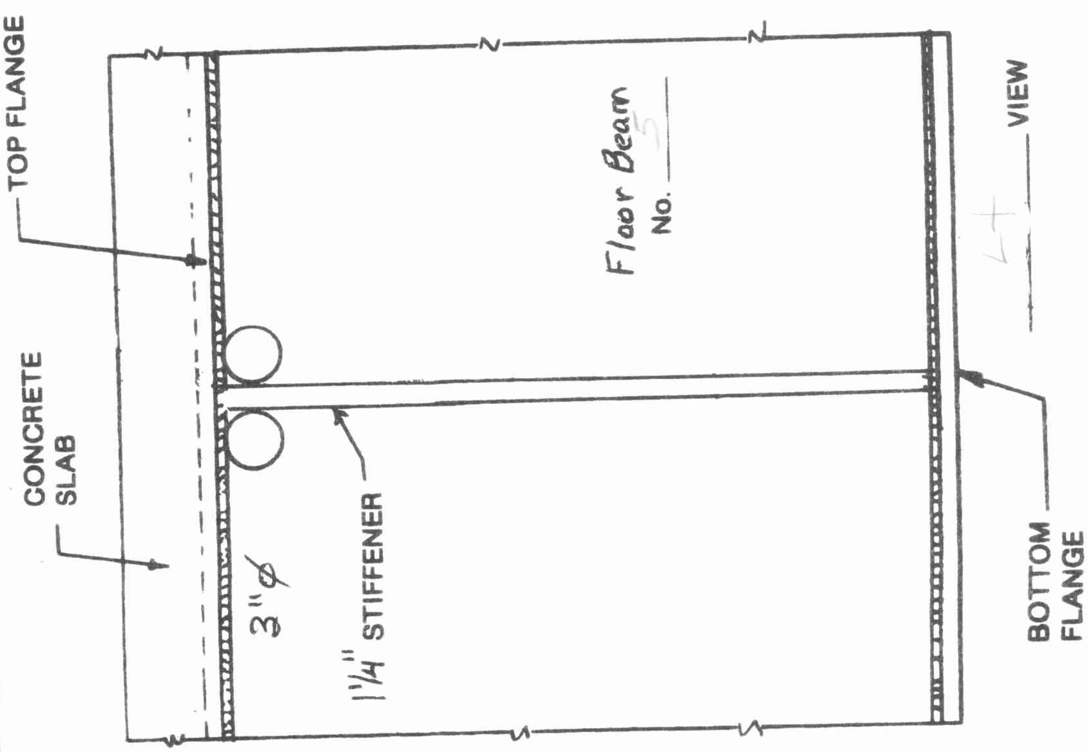
F.B. #0

Form 810039
3-92

Scale	Bridge No. 8550.2 R 030	Sketch by	Date	Page
	Sketch of: Lt Girder	Bvn	10-1-12	B-12A
	Span No. #1 F.B. #5 @ Pier #1			

Location "B" over Pier #1



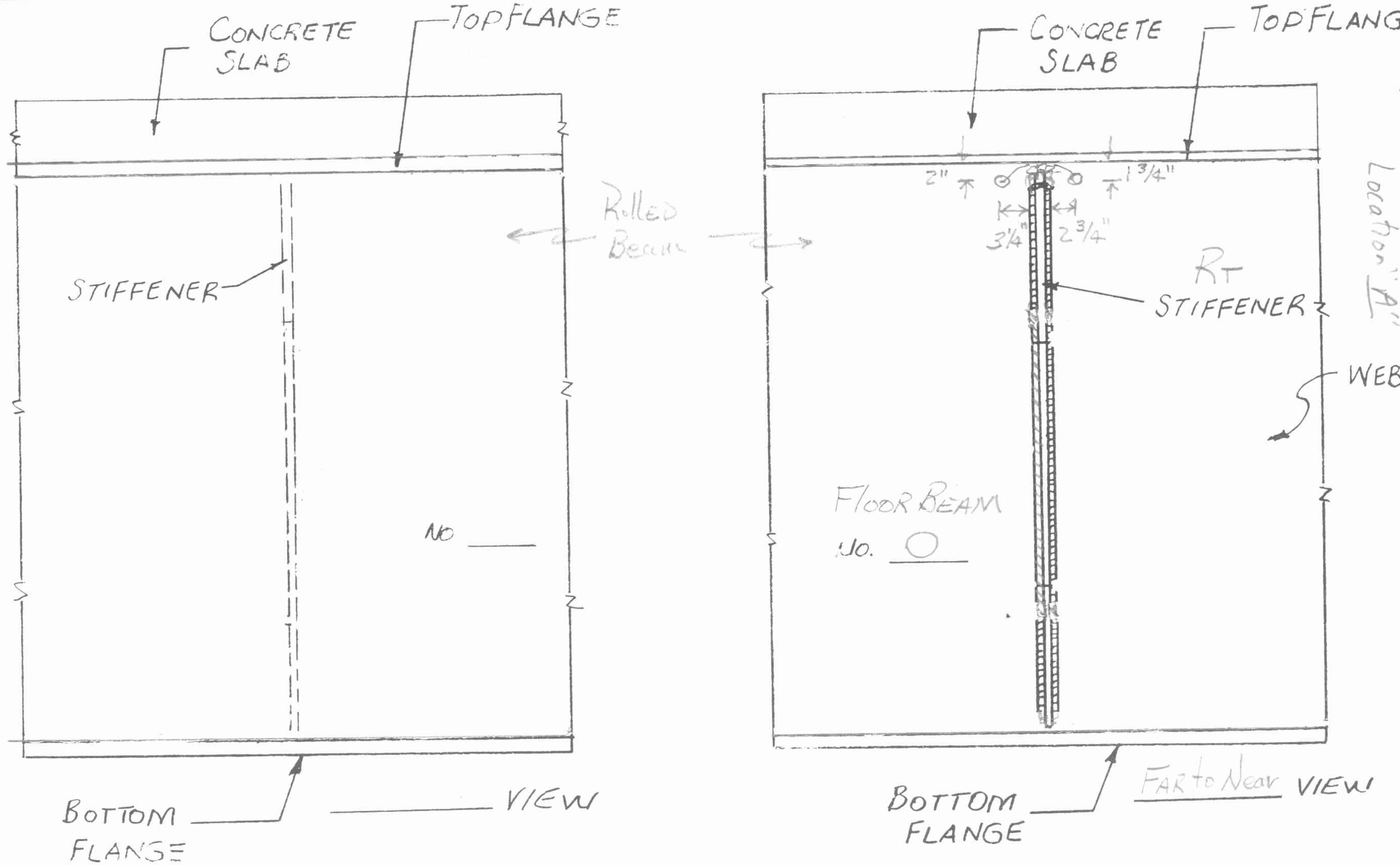


Crack Found By	Crack Found Date	Crack U.T. By	Crack U.T. Date	Holes Drilled By	Holes Drilled Date
				Koob	2012

Form 810040
6-77

Scale	Bridge No. 8550.2R 030	Sketch by	Date	Page
	Sketch of: Crack in Floor beam #0	Team #1	4-17-00	B-12 B
	Span No. 1 RT Stiffner			

Location "A"

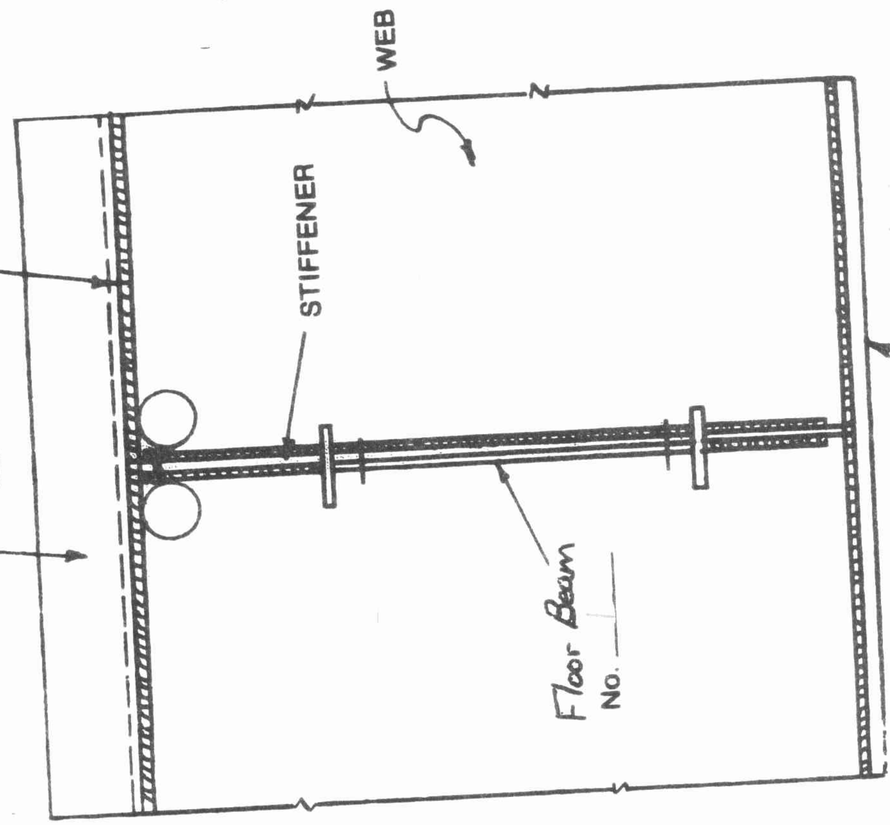


Crack Found		Crack U.T.		Holes Drilled		Crack Found		Crack U.T.		Holes Drilled	
By	Date	By	Date	By	Date	By	Date	By	Date	By	Date
Team #1	4-3-00	Team #1	4-3-00	Howe	4-11-[illegible]						
Team #1	[illegible] 4-17-00	Rks	10-20-08 NK								
Holm	7-17-01 NC	Buh	10-1-12 NC								
Holm	7-11-02 NC										
Buh	11-9-04 NC										

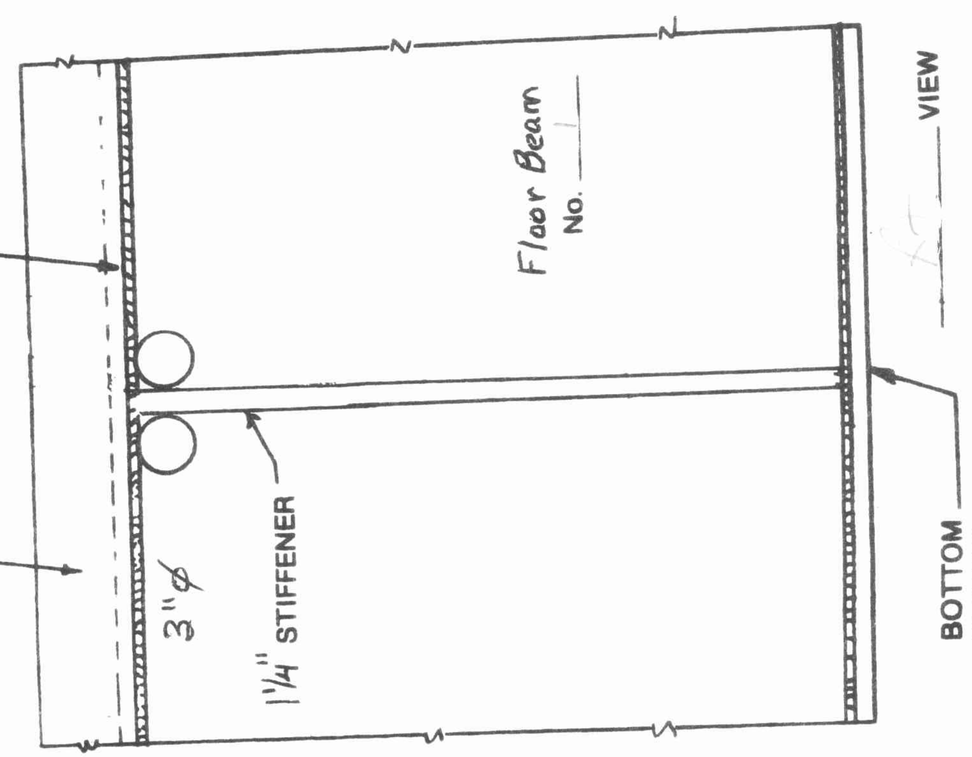
Form 810039
3-92

Scale	Bridge No. 8550.2 R030	Sketch by	Date	Page
	Sketch of: Rt Girder		10-1-12	B-120
	Span No. #2 F.B. #1 @Pier #1			

Location "C" over Pier #1



Holes Drilled		Crack U.T.		Crack Found	
By	Date	By	Date	By	Date

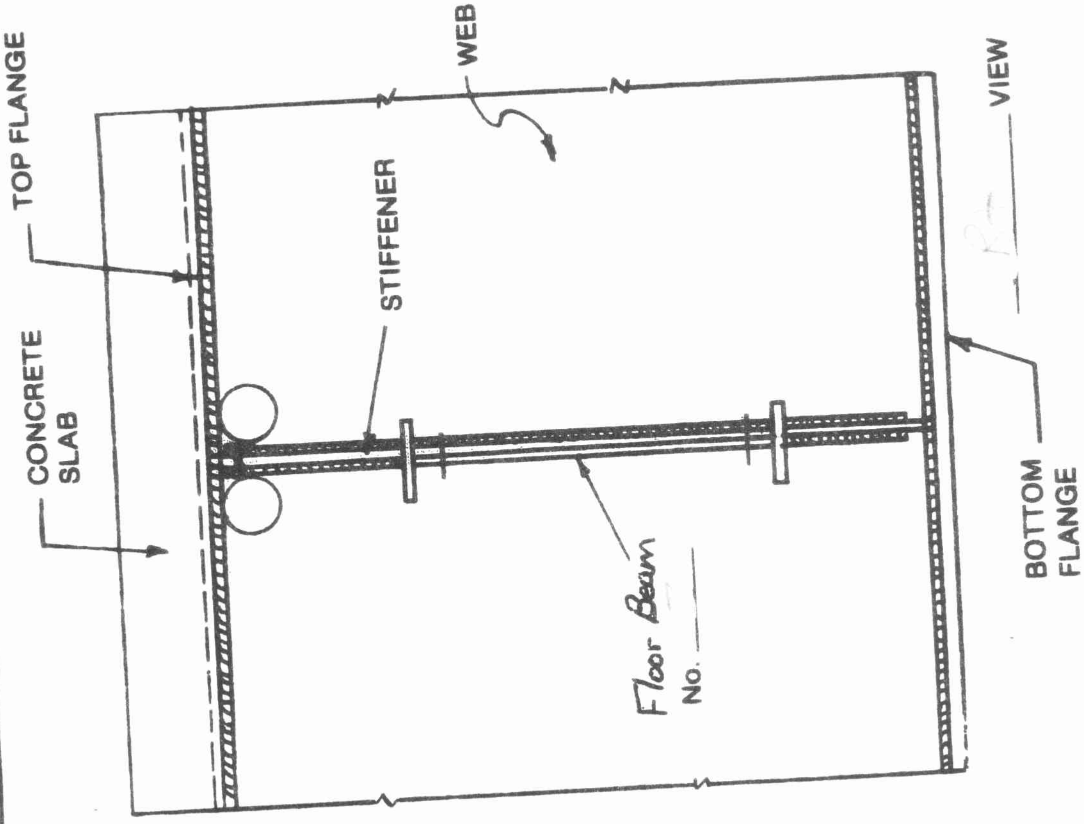


Holes Drilled		Crack U.T.		Crack Found	
By	Date	By	Date	By	Date
Koob	2012				

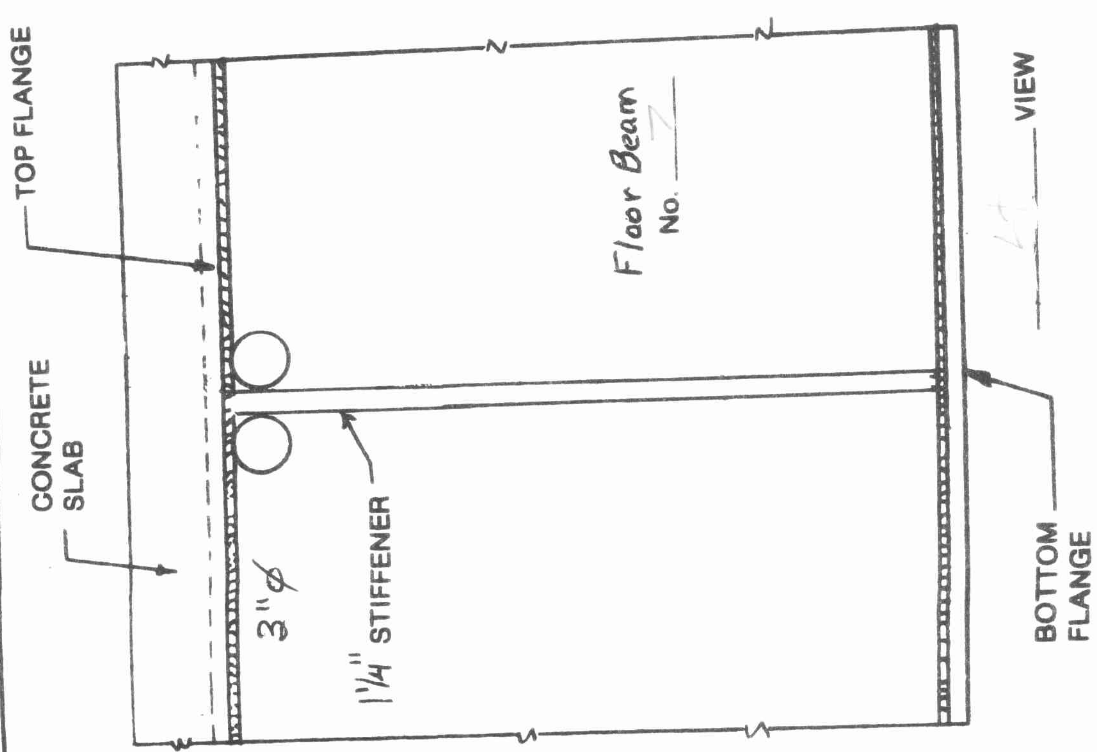
Form 810039
3-92

Scale	Bridge No. 8550.2 R 030	Sketch by	Date	Page
	Sketch of: Lt Girder	Fvin	10-1-12	B-12D
	Span No. #2 F.B. 7 @ Pier #2			

Location "C" over Pier #2



Holes Drilled By	Holes Drilled Date	Crack U.T. By	Crack U.T. Date	Crack Found By	Crack Found Date



Holes Drilled By	Holes Drilled Date	Crack U.T. By	Crack U.T. Date	Crack Found By	Crack Found Date
Koob	2012				

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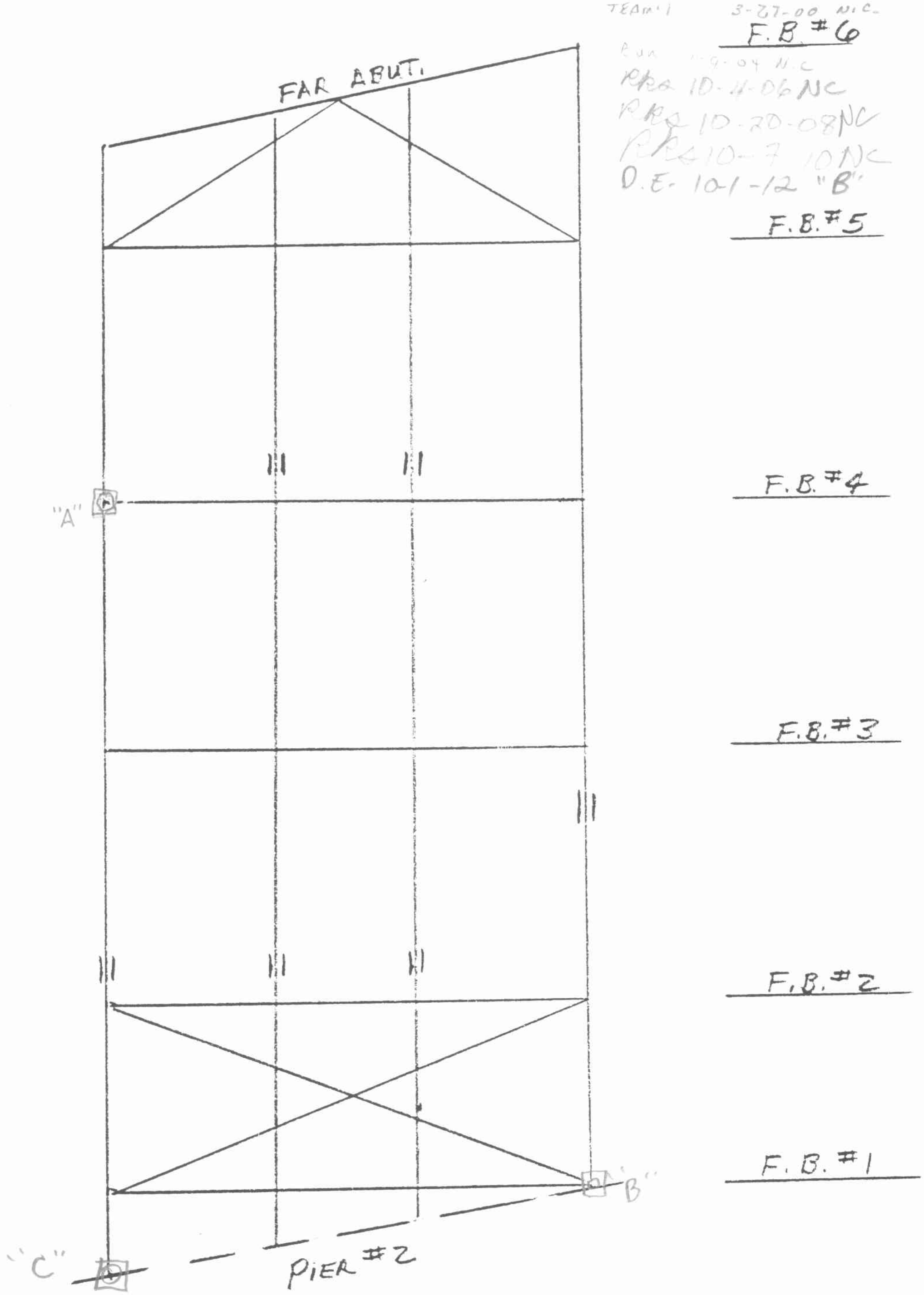
-77

Scale	Bridge No. 8550.2 ℄ 020	Sketch by	Date	Page
	Sketch of: STEEL LAYOUT – SPAN # 3	D.G.B	N.C. 12/12/86	~~B-33~~
		D.G.B	N.C. 6-28-88	B-12E

Holm 7-17-?? NC
Holm 7-11-02 NC

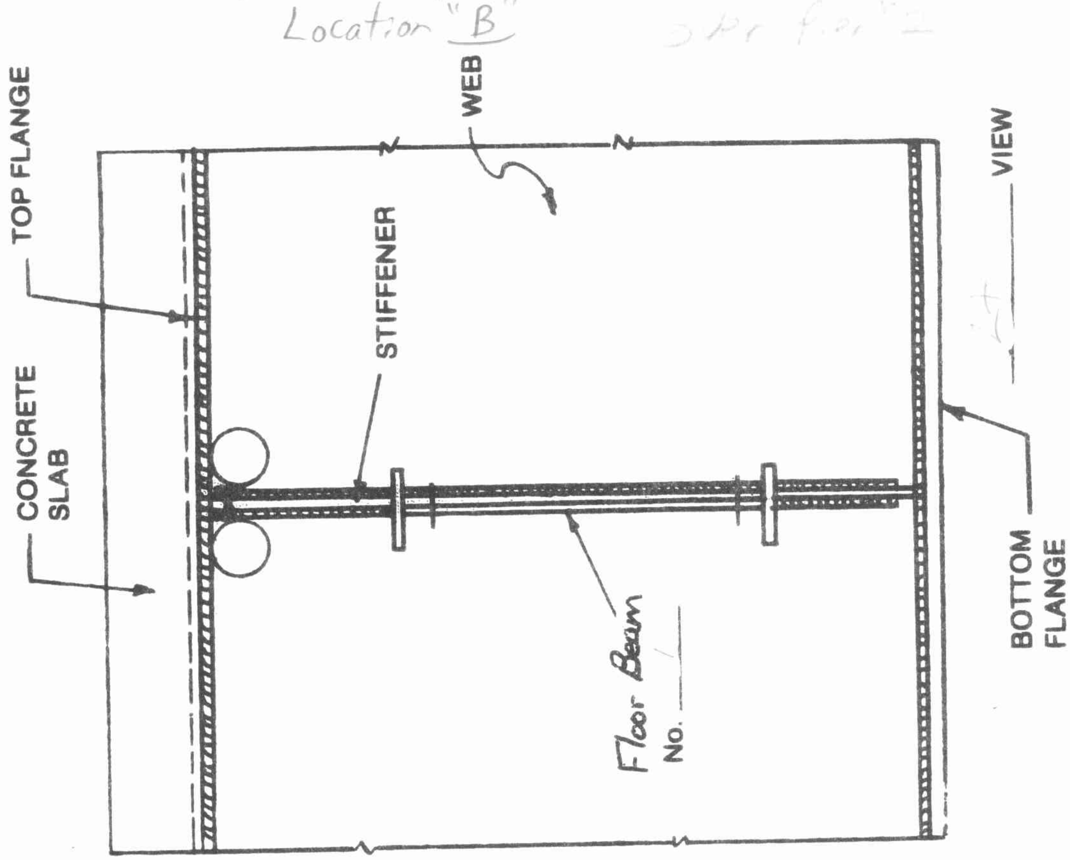
Hou... 3 pos... 8-27-90
Holm 11-9-92 No New Cracks
Holm 8-29-94 NC
D.G.B. 10-16-96 N.C.
[illegible]
TEAM 1 3-27-00 N.C.
... 11-9-04 N.C.
RRA 10-11-06 NC
RRA 10-20-08 NC
RRA 10-7-10 NC
D.E. 10-1-12 "B"



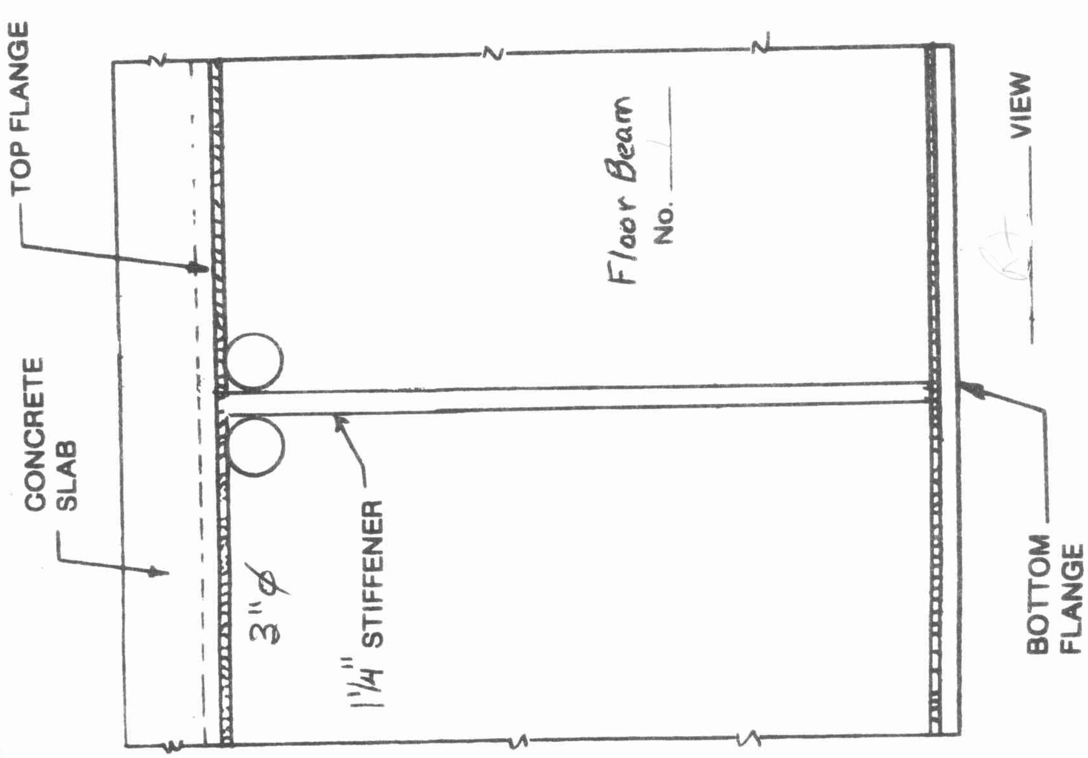
Form 810039
3-92

Scale	Bridge No. 8550.2 R 030	Sketch by	Date	Page
	Sketch of: Girder		10-1-12	B-12F
	Span No. #3 F.B. 1 @ Pier #2			

Location "B"



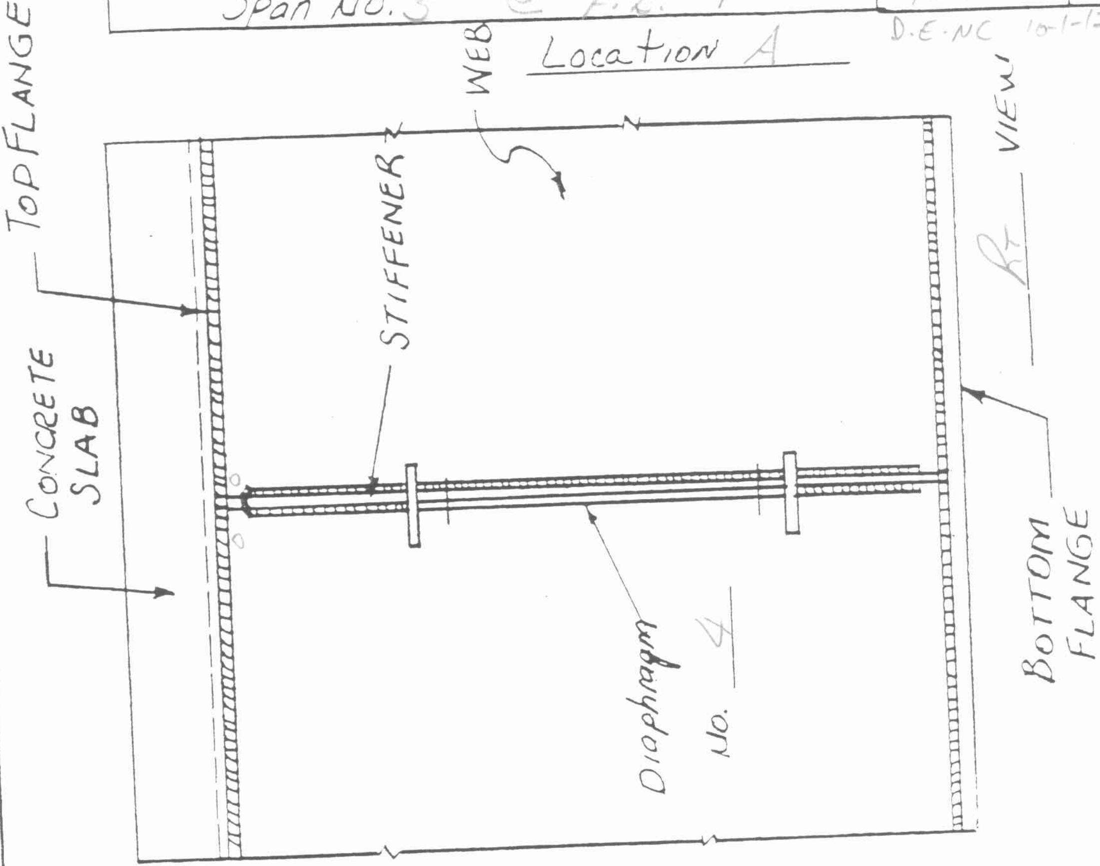
Holes Drilled		Crack U.T.		Crack Found	
By	Date	By	Date	By	Date



Holes Drilled		Crack U.T.		Crack Found	
By	Date	By	Date	By	Date
Koob	2012				

Scale	Bridge No. 8550.2R C30	Sketch by	Date	Page
	Sketch of: Crack in Lt Girder	Team #1	Copied 7-10-02	B-13
	Span No. 3 @ F.B. # 4	Rks	10-7-10 NC	
		D.E.NC	10-1-12	

Location A



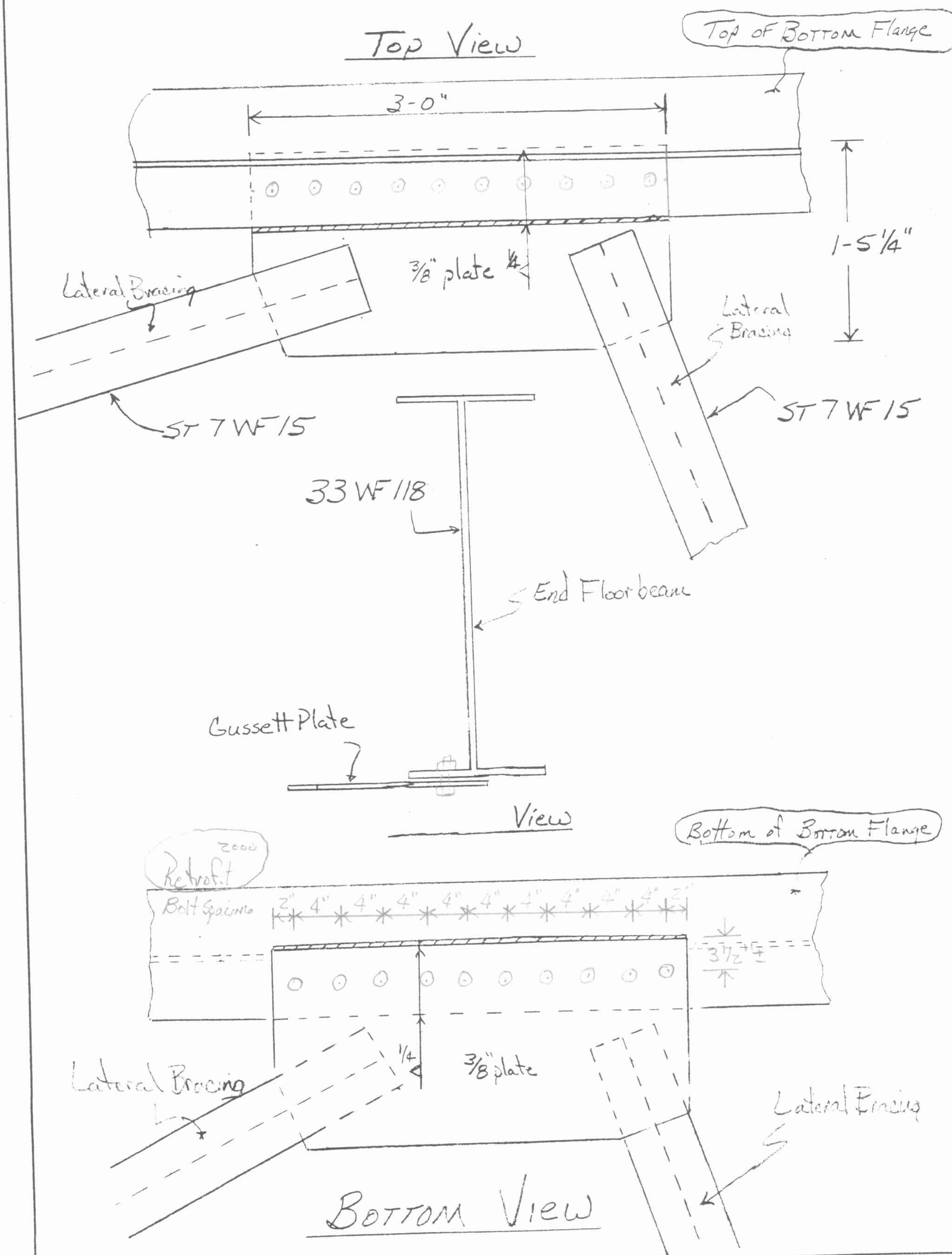
Crack Found By	Crack Found Date	Crack U.T. By	Crack U.T. Date	Holes Drilled By	Holes Drilled Date

Crack Found By	Crack Found Date	Crack U.T. By	Crack U.T. Date	Holes Drilled By	Holes Drilled Date
DOB	8-29-84	W.C.	11-20-84	Dist Bridge	11-20-84
Holm	NC 7-11-02				
	11-9-04 NC				
Holm	10-#-06 NC				
Rks	10-20-08 NC				

Form 810040
1-91

Scale	Bridge No. 8550.2B 030	Sketch by	Date	Page
10	Sketch of: END Floorbeam & Gussett Plate	Team #1	Bolted Connection 4-12-00	B-14
		Hogan / Holm	7-11-02 NC / 11-9-04 NC	
		RRo / RRo	10-4-06 NC / 10-20-08 NC	
		RKn	10-7-10 NC	
		BMn	10-1-12 NC	

END Floorbeam #0
Span #1 over NEAR Abutment

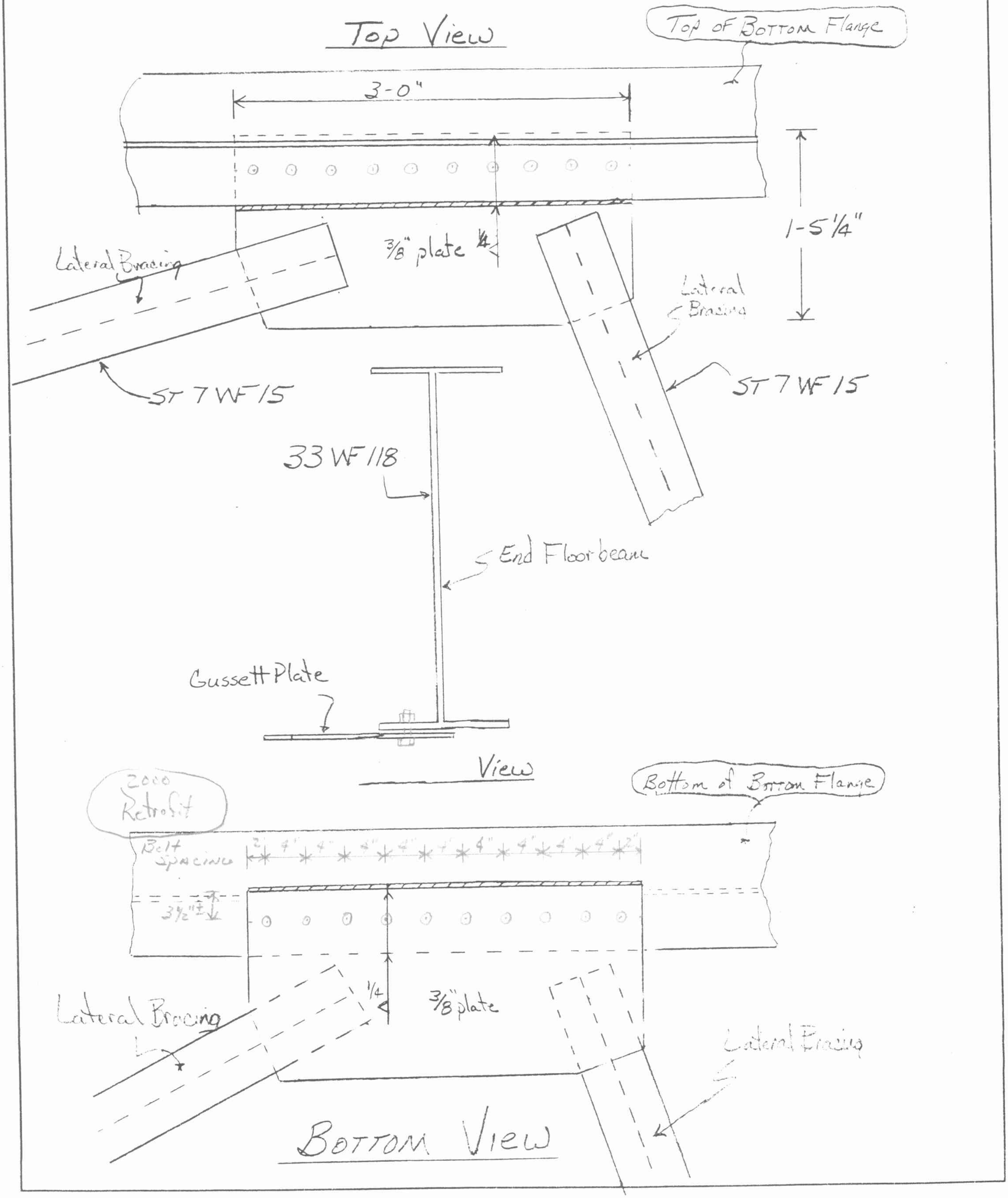


Form 810040
1-91

Scale	Bridge No. 8550.2ᴮ 030	Sketch by	Date	Page
10	Sketch of: END Floorbeam & Gussett Plate	Holm	Bolted Connection 4-17-00	B- 15
		Holm	7-11-02 NC	
		Holm	11-8-04 NC	
		RKG	10-4-06 NC	
		RKG	10-20-08 NC	
		RKG	10-7-10 NC	
		Bun	10-1-12 NC	

END Floorbeam #6

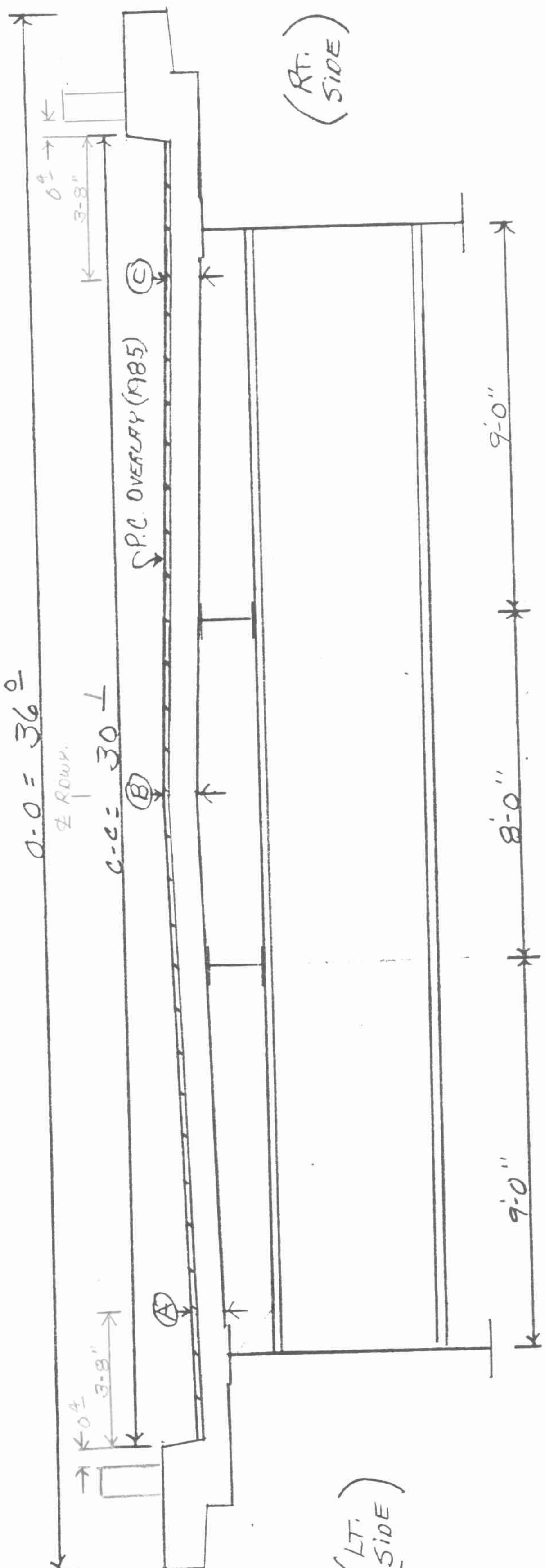
Span #3 over FAR Abutment



Form 810040
6-77

Scale	Bridge No. 3550.2 & 230	Sketch by	Date	Page
	Sketch of: Roadway cross-section	BOYO	P.C. OVERLAY 12-22-86	~~B-43~~
		D.G.B.	N.C. 6-28-88	~~B-14~~ B-16

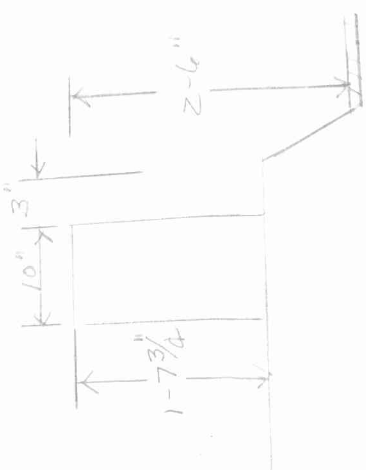
Horn	N.C. 9-4-90
Helm	11-10-92 NC
D.G.B.	8-29-94 N.C.
D.G.B.	10-8-96 N.C.
D.G.B.	5-19-98 N.C.
TEAM 1	3-27-00 N.O.I.
Helm	7-11-02 NC
Helm	11-9-04 NC
RKO	10-4-06 NC
RKO	10-20-08 NC
RKS	10-7-10 NC



Average Deck Thickness

SPAN	A	B	C	AVG
1	.82	.89	.87	10 9/16"
2	.80	.84	.79	[illegible] 7/8"
3	.72	.78	.75	9 1/8"

PLAN DECK THICKNESS = 7 1/4" (NOMINAL)



HANDRAIL

Scale	Bridge No. 8550.2B030	Sketch by	Date	Page
	Sketch of: Span No. 1 Bottom Deck	Boro	(N.C.) 9-28-84	~~B-42~~
		Holm	12-12-86	B-~~44~~

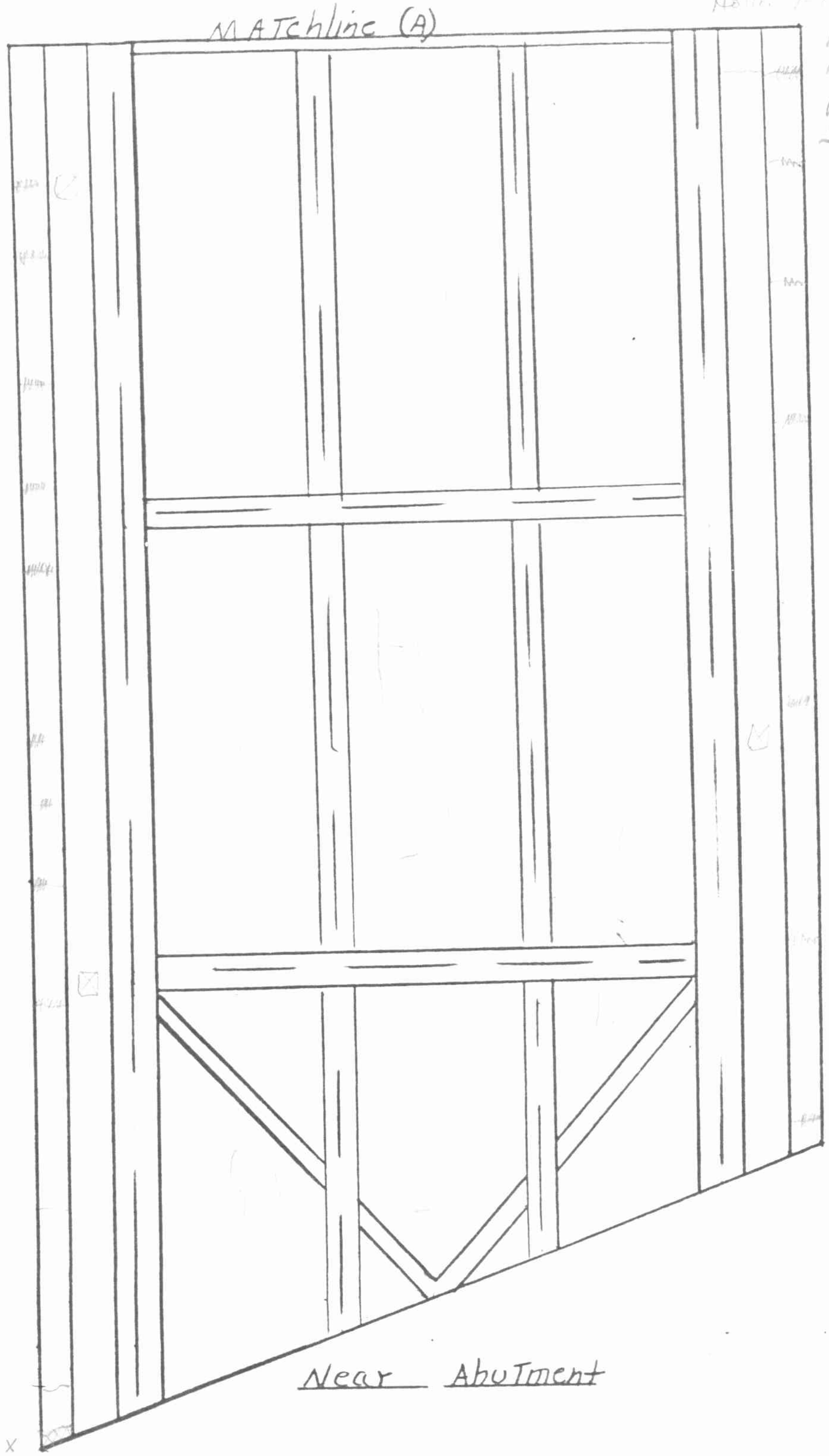
~~B-15~~
B-17

	N.I
Boro	[illegible]
[illegible]	9-4-95
Holm	11-10-92 [illegible]
Holm	[illegible] NC
[illegible]	[illegible] N.C.
E.L.E.	5-13-98 N.C.
Boro	3-29-00 N.C.
Holm	7-11-02 N.C.
Holm	11-9-04 NC
RKs	10-4-06 NC
RKs	10-7-10 NC
D-E-NC	10-1-12

(2)

NOTE: Several '94 ~~Some~~ Hairline Random Cracking (1986)

MATchline (A)



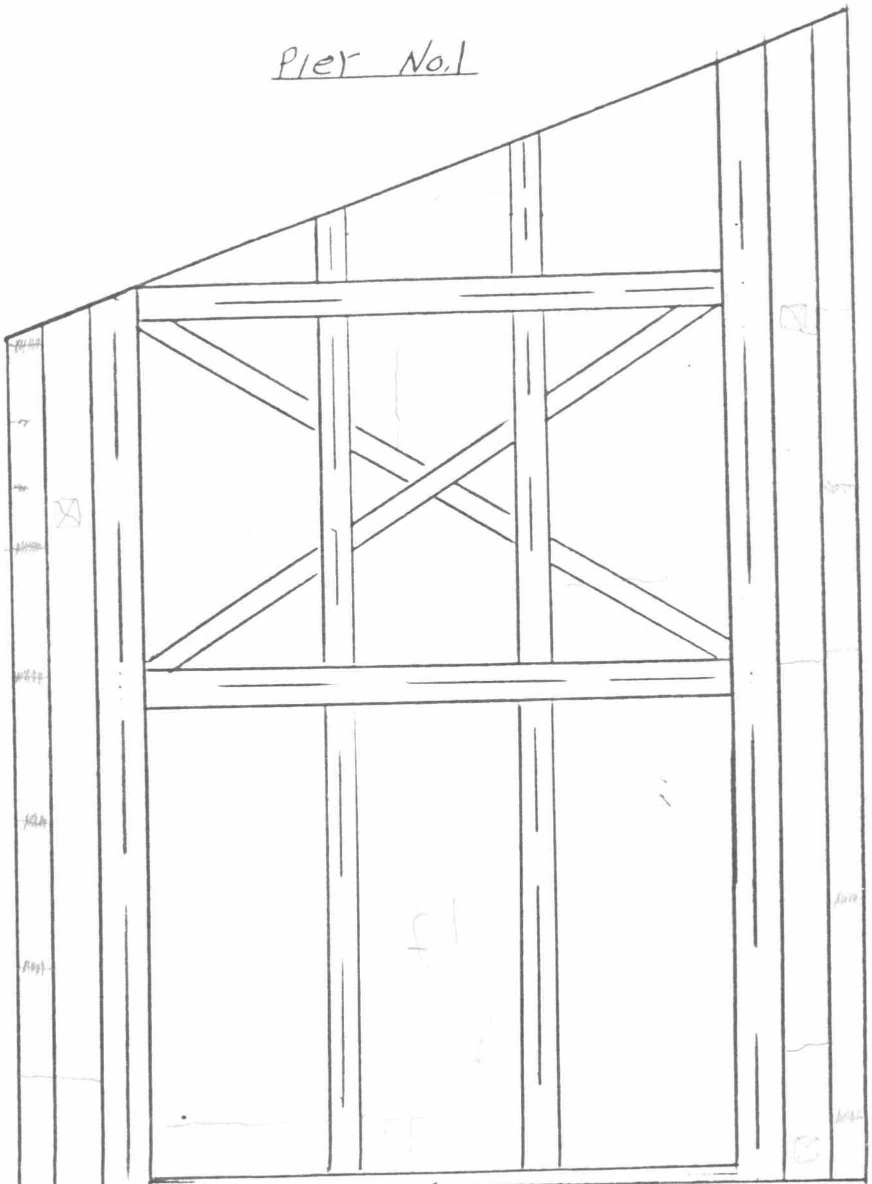
Near Abutment

Scale	Bridge No.	Sketch by	Date	Page
	Sketch of: Span No. 1 - Bottom Deck	Bom	3-23-84	~~B-43~~
		Holm	12-12-86	~~B-45~~
				~~B-16~~
				B-18

Note ~~Some~~ Several '94 Hairline random cracking (1986)

Holm	11-12-92 N.N
Holm	8-23-94 N.N
D.L.B.	10-16-96 N.C.
	9-19-98 N.C.
Boyd	3-23-00 minor
Holm	7-11-02 NC
Holm	11-9-04 NC
RRS	10-4-06 NC
RRS	10-7-10 NC
D.E.	NC 10-1-12

Pier No. 1

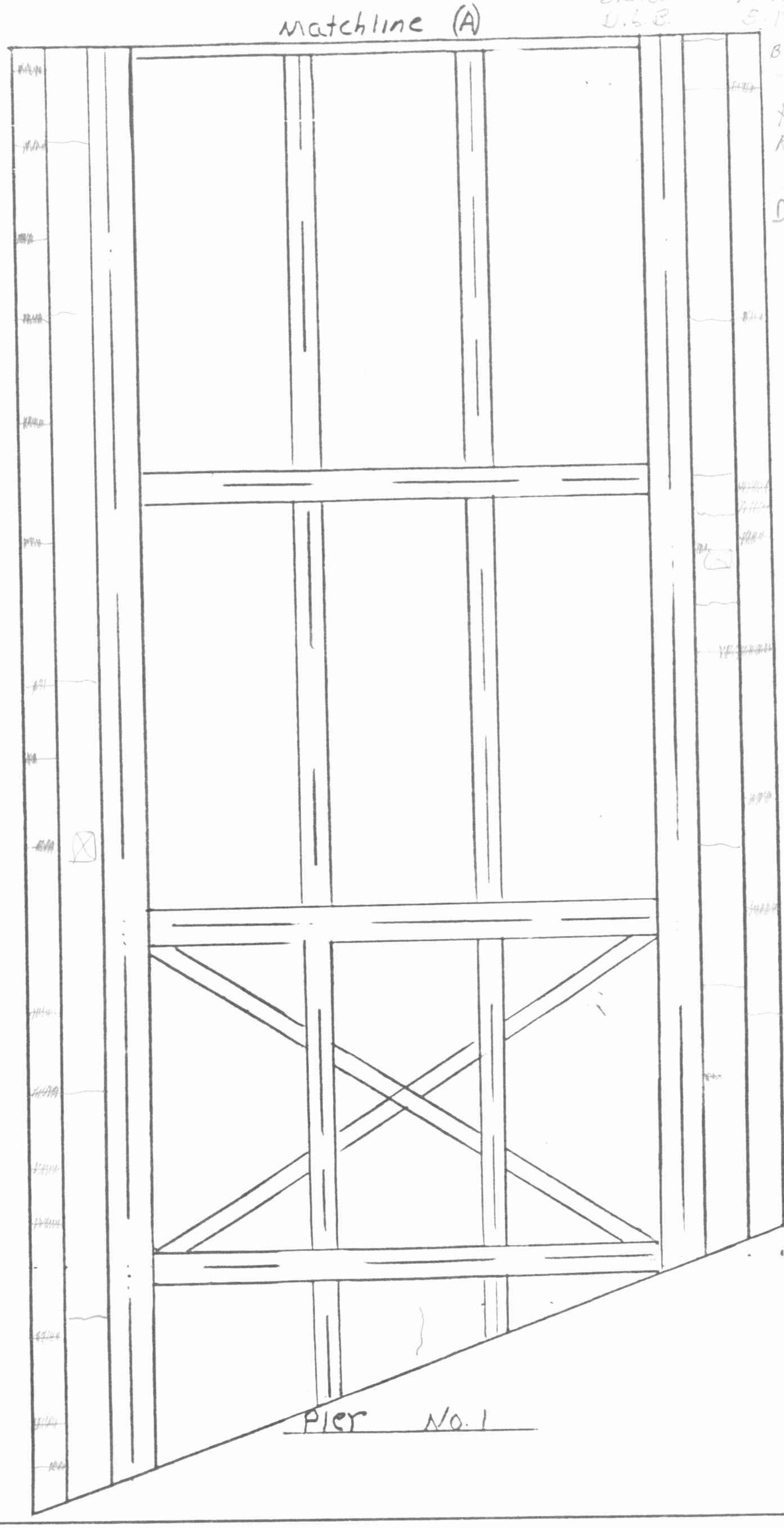


Matchline (A)

	Bridge 8550.2 030	Sketch by	Date	Page
	Sketch of. SECT. NO. E – [illegible] DECK	Boro	(N.C.) 8-28-84	~~B-44~~
		Holm	12-12-86	B-46

Note: '94 Several ~~Some~~ RANDOM CRACKING (1986)

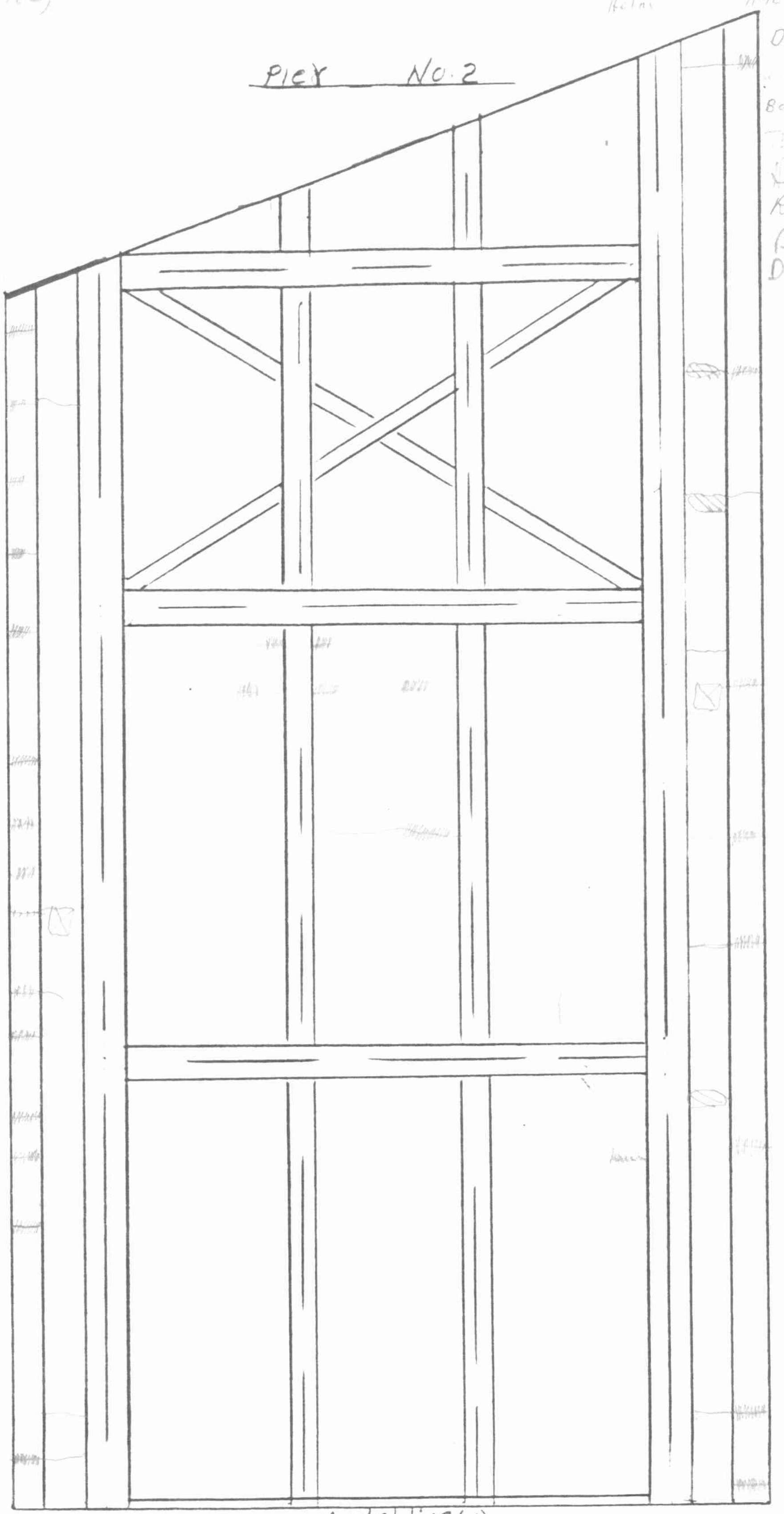
	MW	~~B-17~~ B-19
Boro	6-_3-_8	
Holm	NC 9-4-90	
Holm	11-10-92 NC	
[illegible]	[illegible] MW	
D.C.B.	10-16-96 N.C.	
D.C.B.	5-19-98 N.C.	
Boro	3-28-00 minor	
[illegible]	7-11-02 N.C.	
Holm	11-9-04 NC	
Rko	10-4-06 NC	
Bun	10-7-10 NC	
D.E.	NC 10-1-12	



Scale	Bridge No. 8550.2 & 020	Sketch by	Date	Page
	Sketch of: Span No 2 - Bottom Deck	Borr	(N.C.) 3-29-94	~~B-15~~
		Holm	12-17-86	~~B-17~~

Note: Several ~~Some~~ Random Cracking (1986)

Pier No. 2



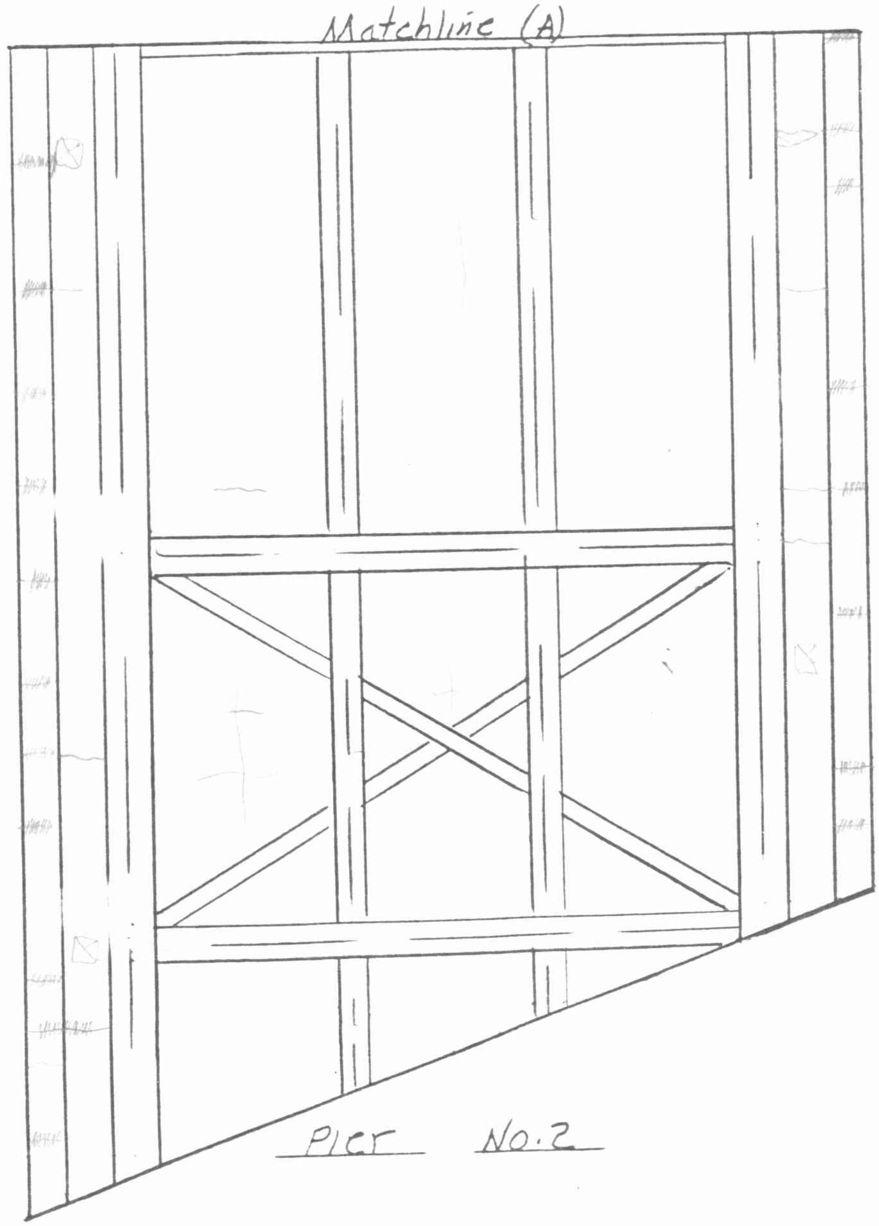
Matchline (A)

Bridge No. 8550.2 L 030	Sketch by	Date	Page
Sketch of: Span No. 3 - Bottom Deck	Roto	Minor 8-28-84	~~B-46~~
	Holm	12-12-86	~~B-48~~ ~~B-19~~ B-21

Note: Small ~~Some~~ Random Cracking. (1986)

Boto	8-8-88	
Holm	11-10-92	Hollow
Holm	8-..-94	N.C.
D.G.B.	10-16-96	N.C.
S.R.	5-12-98	N.C.
Boto	3-28-00	N.C.
Holm		
Holm		
Rks	10-4-06	NC
Rks	10-20-08	NC
	10-7-10	NC
D.E.	10-1-12	NC

Matchline (A)

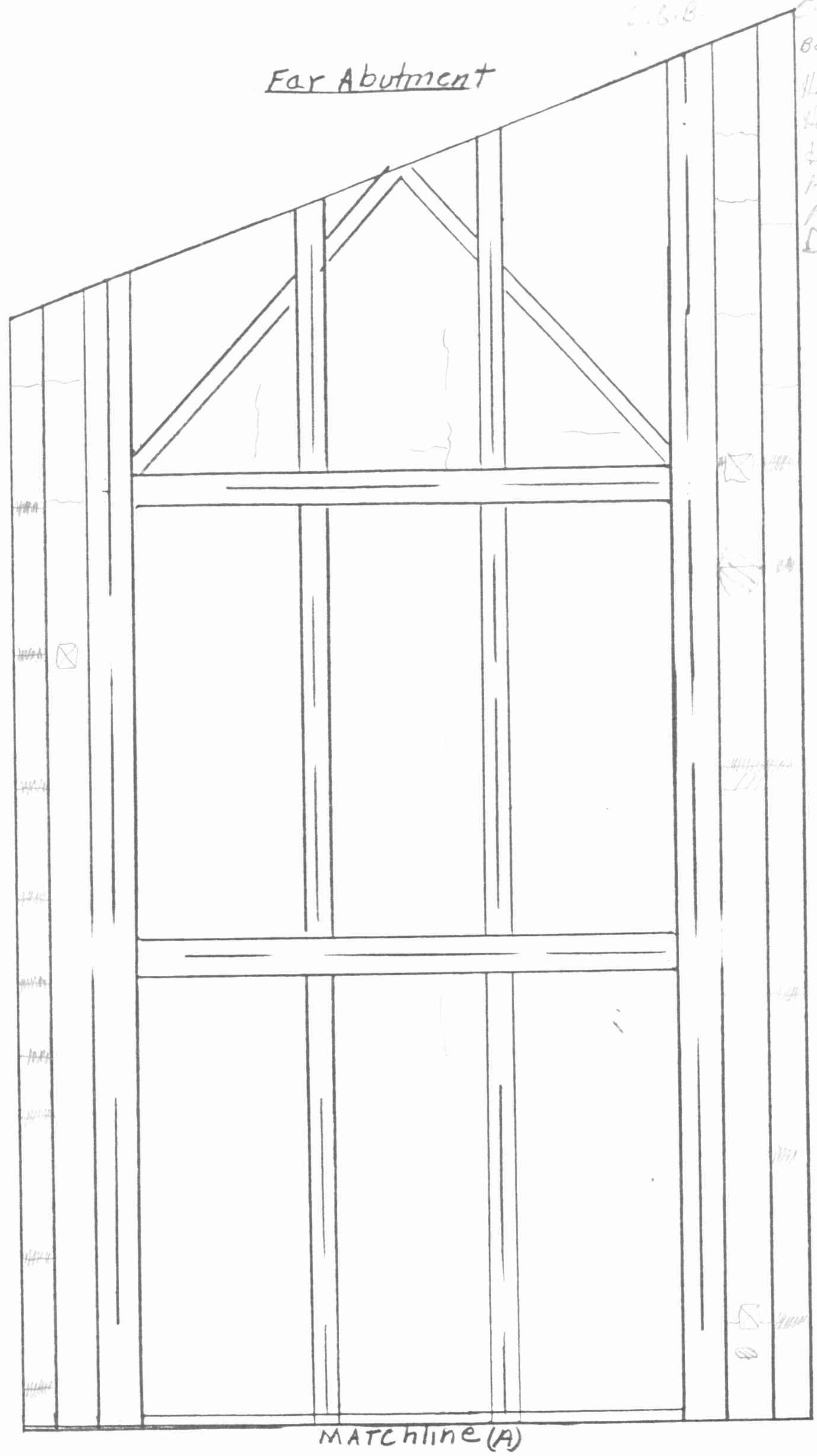


Scale	Bridge No. 8550.2 R 0.30		Date	Page
	Sketch of: Span No.3 - Bottom Deck	Boyo	Minor 8-28-84	B-48
		Holm	12-12-86	B-49

B-20
B-22

'94 Several
Note: Some Random Cracking '86

Boyo 3-28-88
Holm 11-10-92 MN
Holm 8-14-94 MN
D.G.B. 10-16-96 N.C.
C.B.B. 10-19-98 N.C.
Boyo 3-29-00 minor
Holm 11-9-04 NC
Holm 10-20-08 NC
FKo 10-7-10 NC
D.E. NC 10-1-12



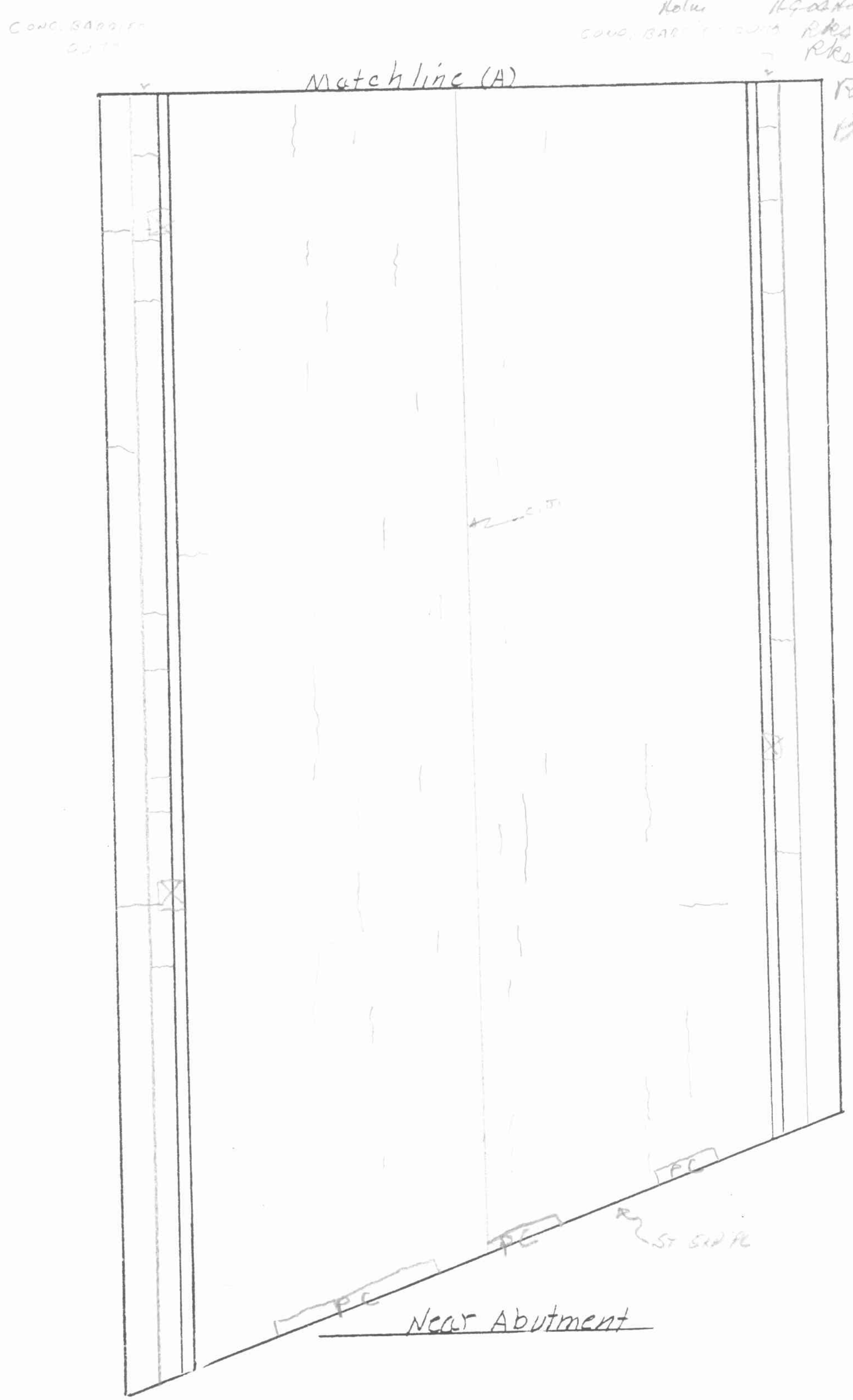
Form 810040
6-77

Scale	Bridge No. 8550.2 R 030	Sketch by	Date	Page
	Sketch of: Span No. 1 Top Deck	Holm	P.C. OVERLAY 12-12-86	~~B-50~~
		Boyo	MINOR 6-28-88	~~B-21~~

Hollow 7 02 Shallow Spalls

Holm	MN 9-4-90	B-33
Holm	11-10-92 NC	
Boyo	3-29-94 minor	
Boyo	10-16-96 N.C.	
HC	5-19-98 N.C	
Boyo	3-28-00 N.C.	
Holm	11-02 No Change	
Rks	10-4-06 NOT ✓	
Rks	10-21-08 Spall	
Rks	11-3-10 PC PATCH	
Bun	10-1-12 NC	

2

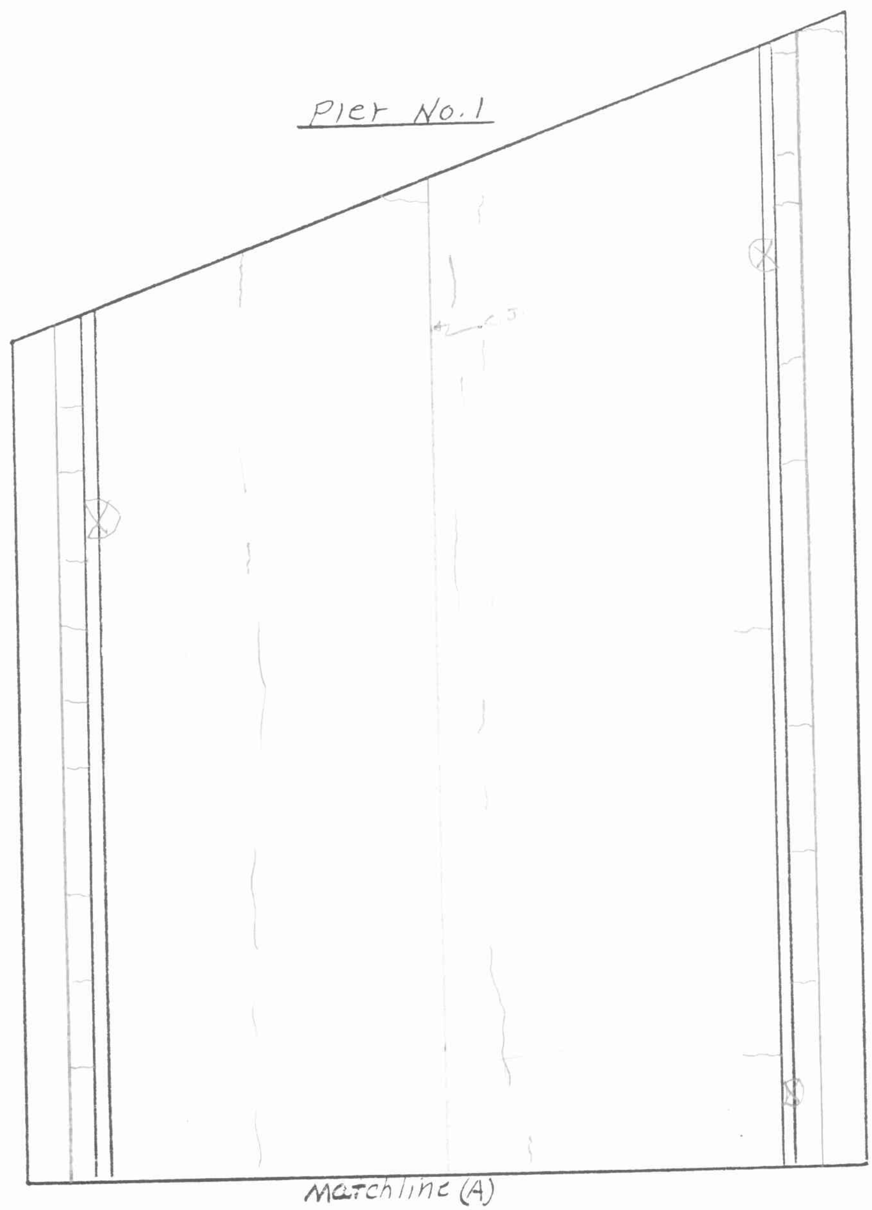


Form 810040
6-77

Scale	Bridge No. 8550.2 B 030	Sketch by	Date	Page
	Sketch of: Span No. 1 Top Deck	Holm	P.C. OVERLAY 12-12-86	~~B-51~~
		Boro	(MINOR) 6-23-93	~~B-22~~

B-24

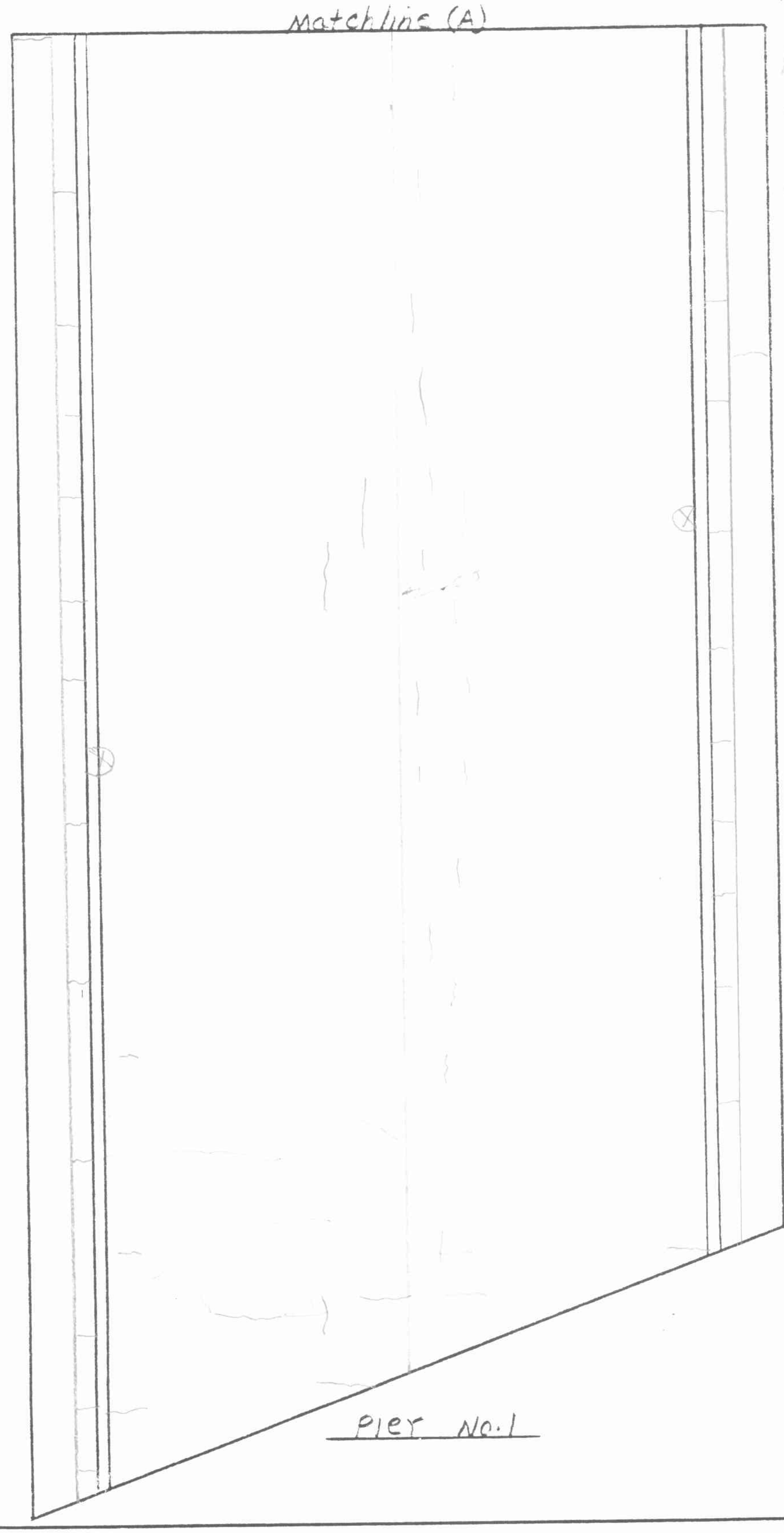
Holm 9-4-90 MM
Holm 11-10-92 NC
Boro 3-29-94 Minor
HC 5-19-98 N.C.
Boro 3-23-00 N.C.
Holm 11-9-04 NC
RRs 10-4-06 MOT ✓
RRs 10-21-08 NC
RRs 11-3-10 NC
Bun 10-1-12 NC



Form 810040
5-77

Scale	Bridge No. 8550.2 R 030	Sketch by	Date	Page
	Sketch of: Span No. 2 Top Deck	Holm	P.C. OVERLAY 12-12-86	~~B-52~~
		Boyo	(MINOR) 6-28-88	~~B-23~~

	N/C	B-25
Holm	9-4-90	
Holm	11-10-92 NC	
Boyo	8-29-94 minor	
Boyo	10-1?-96 N.C.	
HC	5-19-98 N.C	
Boyo	3-29-00 minor	
[illegible]		
Holm	11-9-02 NC	
Rkd	10-4-06 NC	
Rko	10-21-08 NC	
Rkd	11-3-10 NC	
Bun	10-1-12 NC	

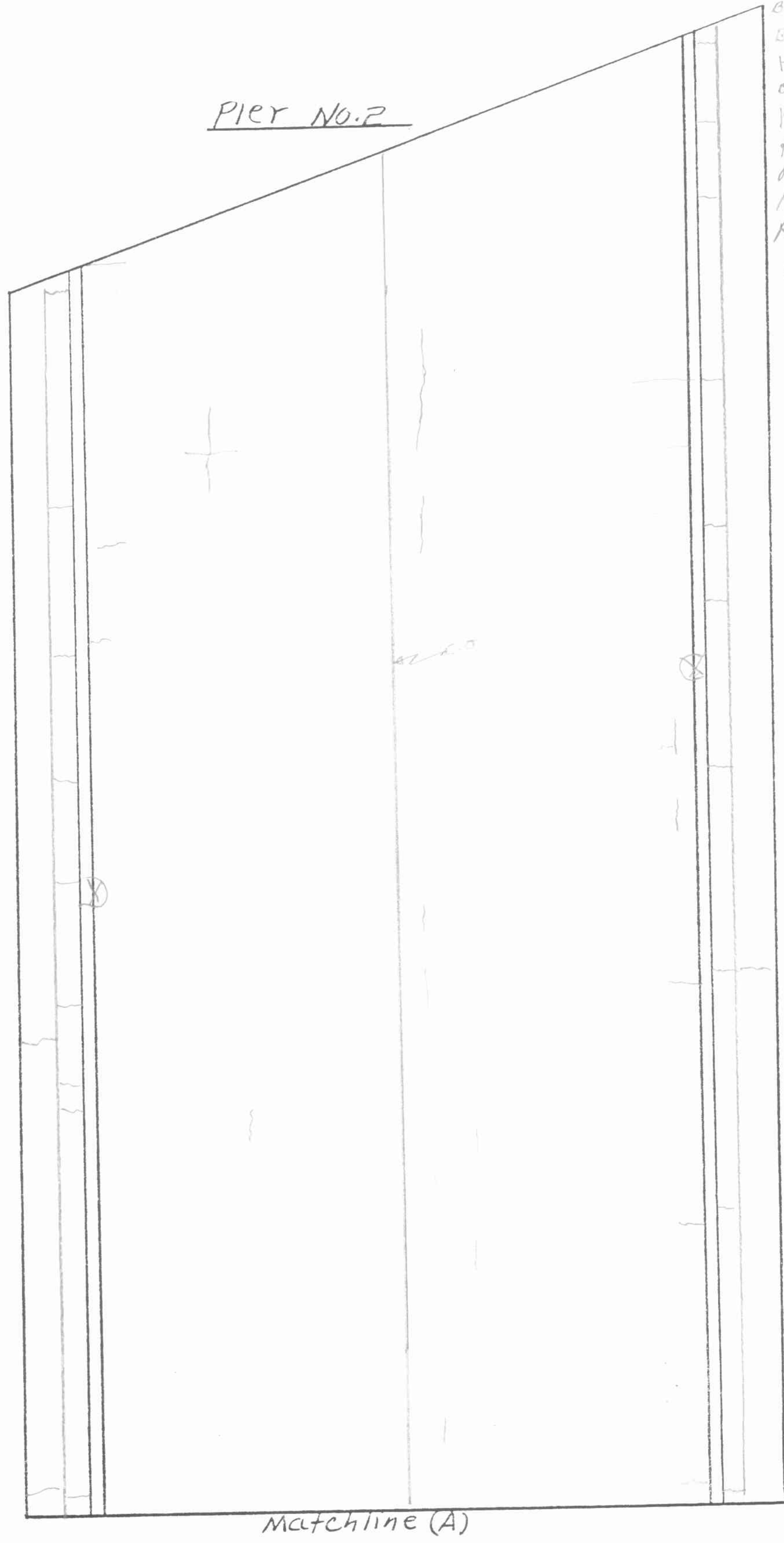


Form 810040
6-77

Scale	Bridge No. 5550.2 R 030	Sketch by	Date	Page
	Sketch of: Span No. 2 Top Deck	Houn	R.C. OVERLAY 12-12-86	~~B-53~~
		Boyo	Minor 6-28-88	~~B-24~~
		Houn	MN 9-4-90	B-26

Boyo 8-29-92 minor
Boyo 10-16-96 minor
HC 5-19-98 N.C
Boyo 3-23-00 minor
Holm 11-9-04 NC
Rks 10-4-06 NC
Rks 10-21-08 NC
Rks 11-3-10 NC
Bun 10-1-12 NC

N



Form 810040
6-77

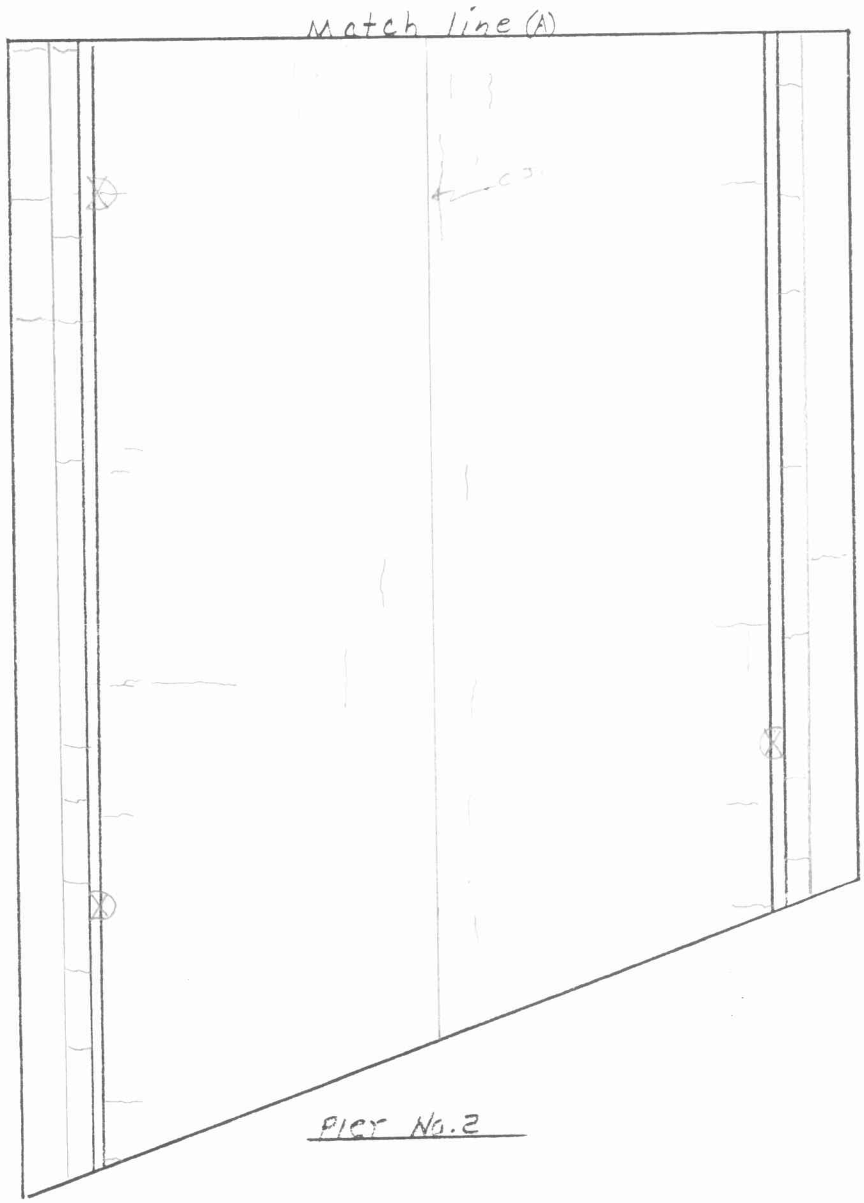
Scale	Bridge No. E550.2B030	Sketch by	Date	Page
	Sketch of: Span No. 3 Top Deck	Holm	P.C. OVERLAY 12-12-86	~~B-54~~
		Boyd	minor 6-28-88	~~B-25~~

B-27

Holm MN 9-4-90
Holm 11-1…

Boyd 9-29-94 minor
Boyd 10-16-96 minor
HC 5-19-98 N.C
Boyd 3-28-00 minor
Holm 11-9-04 NC
Rko 10-4-06 NOT V
Rko 10-…-08 NC
Rko 11-3-10 NC
Bun 10-1-12 NC

N

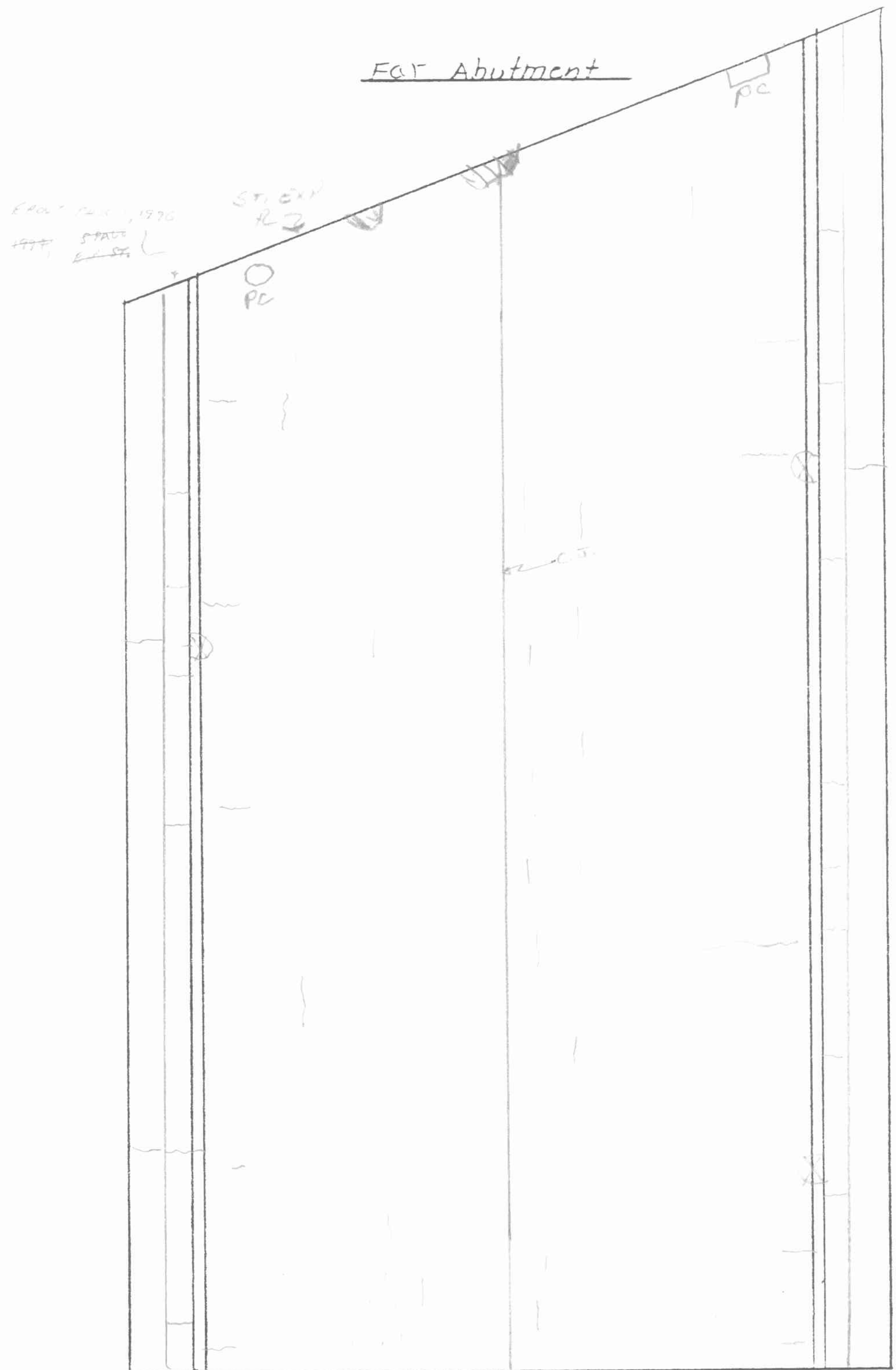


Form 810040
5-77

Scale	Bridge No. 2550.2 B 030	Sketch by	Date	Page
	Sketch of: Span No. 3 Top Deck	Holm	P.C. OVERLAY 12-12-86	~~E-58~~
		Boyo	MINOR 6-28-88	~~B-26~~
			MN 9-4-90	B-28
		Holm		
		H[illegible]	[illegible]	
		Boyo	8-29-94 Minor	

Boyo 10-16-96 N.C.
HC 5-18-98 N.C.
Boyo 3-28-00 N.C.
Holm 7-11-02 [illegible]
Holm 11-9-04 Spall Hole
RKa 10-4-06 Not V
RKa 10-21-08 Hole PC Patch
RKa 11-3-10 PC Patch
BHa 10-1-12 Mill[illegible]

Far Abutment



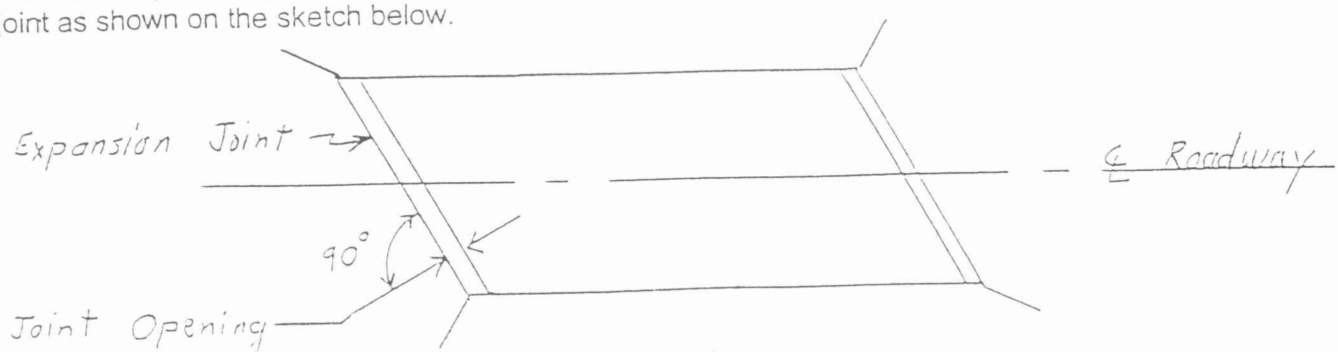
Matchline (A)

Form 810040 08 01

Scale	Bridge No. 8550.2R030	Sketch by	Change since last insp.	Date	Page
	Sketch of: Expansion or Relief Joint	Bun		11-9-04	B-29
		RKS		10-4-06	B-
				10-21-08	B-
		~~RKS~~		~~10-?-10~~	B-
		Bun		10-1-12	B-

Location	Clearance at Left Gutter	Clearance at Center Line	Clearance at Right Gutter	Type of Joint	Remarks: Temp: 60
100' From near Abut.	>2 →		→	Polyurethane Relief Joint	
Over near Abut	$2\frac{1}{4}$"	2"	$2\frac{1}{4}$"	Sliding Steel Expansion Jt	
Over Far Abut	2"	$1\frac{7}{8}$"	$1\frac{7}{8}$"	↓	10' ± VERTICAL STL PLATE MISSING IN LT LANE
65' Past far Abut	1"	1"	1"	Polyurethane relief Joint	

The deck expansion joint opening for skewed bridges is measured perpendicular to the expansion joint as shown on the sketch below.



Bridge - Plan View

Bridge Number: 8550.2R 030	Sketch By	Date	Page
Sketch of: Guardrail Defects	D.E.	10-1-12	B-29A

Rail Height	NL	NR	FL	FR
27" W-Beam Top < 25"				
27" W-Beam Top > 32"				
31" W-Beam Top < 28"				
31" W-Beam Top > 36"				
32" Thrie Beam Top < 28"				
32" Thrie Beam Top > 36"				

End Terminals	NL	NR	FL	FR
Anchor Cable - Missing or Loose (Moves > 1")	X	X	X	
Cable Bracket - Missing, Loose, or Not Seated				
Bearing Plate - Missing, Loose, or Twisted				
Circular End - Missing, Disconnected, or Torn				
Impact Head Prevented From Smooth Travel				
Impact Head Loose or Not Attached to Post				

General Construction	NL	NR	FL	FR
Splice Bolt(s) Missing, Loose, Damaged				
Anchor Bolt(s) Missing, Loose, Damaged				
Post(s) - Missing, Broken, or Rotted				
Post(s) - Separated from rail				
Blockout(s) - Missing, Broken, or Rotted				
End Post Soil Tubes ≥ 4" Above Ground				

Rail Geometry	NL	NR	FL	FR
Rail Dented - W-Beam < 9" or Thrie Beam < 17"				
Rail Deflection > 6" at Any Point				
Flattening W ≥ 17" or Thrie ≥ 26" over ≥ 6' of rail				
Flattening W ≥ 17" or Thrie ≥ 26" over ≥ 12' of rail				
Vertical Tears of Any Length				
Horiz. Tears ≥ 12" Long and/or ≥ 1/2" Wide	X	X		
One or more holes in W-Beam or Thrie Beam				
Section Loss within 1-1/4" of a bolt				

Terminus:	NL	NR	FL	FR
FLEAT	X	X	X	
None				X

Rail:	NL	NR	FL	FR
W-Beam, Square Posts	X	X	X	
None				X

Transition:	NL	NR	FL	FR
thrie beam 5-Bolt thru	X	X	X	
None				X

Misc. Findings	NL	NR	FL	FR

Comments:

Form 810040
6-77

Scale	Bridge No. 8550.2 R 030	Sketch by	Date	Page
	Sketch of: DECK THICKNESS		12-22-86	B-~~57~~
				~~B-28~~ B-30

	Left	℄ Top Deck	Right
Span # 1 HI 104.25	99.96 4.29	100.15 4.10	100.00 4.25
HI	.92 99.14	Bottom .89 99.26	.87 99.13
Span # 2 HI 104.25	100.03		
HI	.80 99.33 +3.00	Bottom .84	.79 99.29 3.01
Span # 3 HI 104.25	99.57	99.74	98.60 5.65
HI	.72 98.35	Bottom .73 98.76	.75 98.35 7.54
Span # ____ HI ____	Left	℄ Top Deck	Right
HI ____		Bottom	

c-c ____ o-o ____ slab ____ sh-sh ____ length ____	100.00 BM Elev. 4.25 97.01 ⊼ – ⊡ – ∅ –

BRIDGE ID: 8550.2R030 INSP. DATE: 10/01/2012

FHWA #48730 EB US 30 OVER SOUTH SKUNK RIVER

Structure Unit:

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
22	Concrete Deck - Protected w/ Rigid Overlay	4	10/01/2012	9750	0	9750	0.00	0.00	0.00
			10/15/2013	9750	0	9750	0.00	0.00	0.00
	The top of the deck has shallow spalls and PC patches along both deck joints and several transverse and longitudinal cracks .								
107/4	Painted Steel I-Beam or Girder	4	10/01/2012	640.03	588.83	51.20	0.00	0.00	0.00
			10/15/2013	640.03	588.83	51.20	0.00	0.00	0.00
	There is scattered light to moderate rust on the main girders.								
113/2	Painted Steel Stringer	2	10/01/2012	640.03	627.23	12.80	0.00	0.00	0.00
			10/15/2013	640.03	627.23	12.80	0.00	0.00	0.00
	There is scattered light to moderate rust on the stringers.								
152/2	Painted Steel Floor Beam	2	10/01/2012	494.02	405.10	49.40	39.52	0.00	0.00
			10/15/2013	494.02	405.10	49.40	39.52	0.00	0.00
	There is scattered light to moderate rust on the intermediate floor beams, and some light to severe rust on the abutment floor beams, mostly on the back wall side.								
210/2	Reinforced Concrete Pier Wall or Shaft of T-Pier	2	10/01/2012	76.00	76.00	0.00	0.00	0.00	
			10/15/2013	76.00	76.00	0.00	0.00	0.00	
234/2	Reinforced Concrete Pier Cap	2	10/01/2012	45.00	45.00	0.00	0.00	0.00	
			10/15/2013	45.00	45.00	0.00	0.00	0.00	
271/4	Reinforced Concrete Stub Abutment	4	10/01/2012	80.00	60.00	16.00	4.00	0.00	
			10/15/2013	80.00	60.00	16.00	4.00	0.00	
	The 2004 inspection of the near abutment noted the bridge seat had a spalled area with exposed rebar and hollow areas between Bearing 1 and the left Floor Beam bearing pedestal. There were additional hollow areas at the center and right ends of the bridge seat. The 2012 inspection finds more hollow on the near footing and seat.								
275/4	Reinforced Concrete Backwall-used w/ Stub Abutment	4	10/01/2012	76.00	57.76	5.32	12.92	0.00	
			10/15/2013	76.00	57.76	5.32	12.92	0.00	
	The 2008 inspection noted the top face of the near backwall had a small spall in the right lane. The 2012 inspection finds no change to this location. The 2008 inspection noted the top face of the far backwall had been PC patched in the left lane. The 2012 inspection finds the PC patch has spalled and is hollow.								

BRIDGE ID: 8550.2R030 INSP. DATE: 10/01/2012

FHWA #48730 EB US 30 OVER SOUTH SKUNK RIVER

Structure Unit:

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
309	Sliding Steel Plate Expansion Joint	4	10/01/2012	64.00	54	10.0	0.00		
			10/15/2013	64.00	54	10.0	0.00		

The 2008 inspection noted the far deck joint was missing a 10 ft. length of the stop bar in the left lane. The top of the backwall has been PC patched. The 2012 inspection finds the PC patch has spalled.

The effective widths of the deck expansion joints, at about 60 degrees F, are as follows:
Sliding plate over the near abutment, 2 inches
Sliding plate over the far abutment, 1 7/8 inches

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
313/2	Fixed Bearing	2	10/01/2012	2	2	0	0		
			10/15/2013	2	2	0	0		
321	Reinforced Concrete Approach Slab	4	10/01/2012	2	0	2	0	0	
			10/15/2013	2	0	2	0	0	

The near approach has a few moderate sized spalls.

The far approach has an AC filled spall at the abutment and a moderate sized spall in right lane.

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
331	Reinforced Concrete Bridge Railing	4	10/01/2012	650.03	585.03	65.00	0.00	0.00	
			10/15/2013	650.03	585.03	65.00	0.00	0.00	

Both retrofit rectangular concrete rails have hairline vertical cracks with some light leaching.

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
352/2	Rocker Bearing	2	10/01/2012	2	2	0	0		
			10/15/2013	2	2	0	0		
352/4	Rocker Bearing	4	10/01/2012	4	3	0	1		
			10/15/2013	4	3	0	1		

The 2004 inspection noted there was severe rust and some pack rust on the abutment bearings. The 2012 inspection finds minor change to these locations.

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
356	Steel - Fatigue Cracks	2	10/01/2012	1	1	0	0		
			10/15/2013	1	1	0	0		

The 1984 inspection identified a fatigue crack in Girder 1, in Span 3, at Floor Beam 4. The crack was confined to two holes drilled in 1984. The 2012 inspection finds no change to this location.

The 2000 inspection identified a fatigue crack in Span 1 at Floor Beam 0. The crack was confined to two holes drilled in 2000. The 2012 inspection finds no change to this location.

In 2012, a 3" core hole was drilled at the intersecting welds above the piers on each girder.

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
359	Bottom of Deck, Slab or Box	2	10/01/2012	1	0	1	0	0	0
			10/15/2013	1	0	1	0	0	0

The 2008 inspection of the bottom of the deck noted hairline cracks with some leaching, mostly in the overhang. The left overhang had a small spall with exposed steel at the near end. The right overhang had several hollow areas. The 2012 inspection finds no change at these locations.

BRIDGE ID: 8550.2R030 INSP. DATE: 10/01/2012

FHWA #48730 EB US 30 OVER SOUTH SKUNK RIVER

Structure Unit:

ELEM NBR	ELEMENT NAME	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
385	Channel Alignment	2	10/01/2012	1	1				
			10/15/2013	1	1				
	The streambed elevation is relatively stable.								
386	Pressure Relief Joint	2	10/01/2012	2	2				
			10/15/2013	2	2				
	The far pressure relief joint is < 2" wide.								

Inspector's Signature

Reviewer's Signature / Date

Iowa Department of Transportation

Maintenance Recommendations

FHWA Number: 48730

Bridge ID.: 8550.2R030

Status: Contract Work

Proposed Maintenance Recommendations

Recommendation Code: 314

- [x] Corrective
- [ ] Preventive
- [ ] Monitor
- [ ] From RMS

Recommendation Text

The far abutment backwall was reported to be broken and deteriorated. Repair is necessary. Repair will probably include repair or replacement of the deck joint over the abutment.

Status

- [ ] Work Already Done

Comments

Bridge will be replaced

Repaired Date:

Repaired By:

Deferred Date:

Deferred By:

Recommend for Contract Work Date: 29-NOV-11

Recommend for Contract Work By: dennis.howe@dot.iowa.gov

Iowa Department of Transportation

Maintenance Recommendations

FHWA Number: 48730

Bridge ID.: 8550.2R030

Status: Open

Proposed Maintenance Recommendations

Recommendation Code: 301

☐ Corrective ☑ Preventive ☐ Monitor ☐ From RMS

Recommendation Text

The severely rusted bearing devices should be cleaned and sealed.

Status

☐ Work Already Done

Comments

Repaired Date:

Repaired By:

Deferred Date:

Deferred By:

Recommend for Contract Work Date:

Recommend for Contract Work By:

Iowa Department of Transportation

Maintenance Recommendations

FHWA Number: 48730

Bridge ID.: 8550.2R030

Status: Open

Proposed Maintenance Recommendations

Recommendation Code: 532

☑ Corrective ☐ Preventive ☐ Monitor ☐ From RMS

Recommendation Text

The guardrails at both ends of the bridge are in need of repair. There are loose anchor cables at all 3 locations.

Status

☐ Work Already Done

Comments

Repaired Date: ______ Repaired By: ______

Deferred Date: ______ Deferred By: ______

Recommend for Contract Work Date: ______ Recommend for Contract Work By: ______

APPENDIX B: BRIDGE PLANS

STATE OF IOWA
STATE HIGHWAY COMMISSION
DESIGN FOR

BRIDGES AND CULVERTS

PRIMARY ROAD SYSTEM

PROJECT NO. FU-1065(10)

STORY COUNTY

JANUARY, 1963

[redacted]

CONSTRUCTION PLANS SHOWING PROJECT AS BUILT

DATE 3-4-64 COPIES PREPARED 3

PREPARED BY Graeme C. George
RESIDENT ENGINEER

ONE COPY APPROVED & FORWARDED TO AMES
______ DIST. ENGR. ______ DATE.

TWO COPIES TO BE MADE & RETURNED TO :—
STEINER SILENCE DIST. ENGR.
ROBERT SHELQUIST RES. MAINT ENGR.

IN LETTING OF MARCH 5, 1963

STA. 1301+20.00
WASHINGTON TOWNSHIP

DUAL 320' X 30' CONTINUOUS WELDED GIRDER BRIDGES 20° SKEW

ESTIMATE OF QUANTITIES

ITEM	UNIT	TOTAL
Concrete	Cu. Yds.	1,272.0
Reinforcing Steel	Lbs.	~~267,444~~ 267350
Structural Steel	Lbs.	~~519,468~~ 572,310
Class 10 Channel Excavation	Cu. Yds.	1,600
Class 20 Excavation	Cu. Yds.	888
Class 21 Excavation	Cu. Yds.	520
Creosoted Piling 96 at 35'	Lin. Ft.	3,360
Untreated Piling (Oak or Gumwood) 192 at 35'	Lin. Ft.	6,720
~~Aluminum Handrail (℄ - ℄ End Posts)~~	~~Lin. Ft.~~	~~1248.0~~
OR Steel Handrail (℄ - ℄ End Posts)	Lin. Ft.	OR 1254.0
Granular Backfill	Tons	897
Welded Wire Fabric Retard (℄ - ℄ End Piles includes Wingdams)	Lin. Ft.	840
Porous Backfill	Cu. Yds.	46

1 40

IN LETTING OF MARCH 5, 1963

DESIGN NO. 3261 T-83N R-24W STA. 1258+95.48 EAST BOUND LANE
SECTION 14 STA. 1259+02.23 WEST BOUND LANE
U.S.#30 RELOC. OVER U.S. #69 WASHINGTON TOWNSHIP

DUAL 211'-3 X 30' & VARIABLE ROADWAY PRETENSIONED PRESTRESSED CONCRETE BEAM BRIDGES 5° 31' SKEW

ESTIMATE OF QUANTITIES

ITEM		UNIT	TOTAL
Concrete		Cu. Yds.	~~901.1~~ 907.3
Reinforcing Steel	199115 ~~198663~~	Lbs.	~~197,294~~
Pretensioned Prestressed Concrete Beams	38' - 4" Special	Only	17
	42' - 6" B1	Only	18
	63' - 4" B6	Only	35
Creosoted Piling 169 at ~~30'~~ 16; 30 at ~~40'~~ 35; 33 at ~~45'~~ 35; 7 @ ~~16~~ 8		Lin. Ft.	4965 ~~7755~~ ~~7867~~
OR Aluminum Handrail (℄ - ℄ End Posts)		Lin. Ft.	OR 814.6
~~Steel Handrail (℄ - ℄ End Posts)~~		Lin. Ft.	~~814.0~~
Concrete Slope Protection		Sq. Yds.	~~894~~ 989.2
Class 20 Excavation		Cu. Yds.	756
Granular Backfill		Tons	285
4"Φ Tile Drain		Lin. Ft.	263
* 2"Φ Rigid Steel Conduit		Lin. Ft.	450
Creosoted Test Piling 2 at 30'		L.S.	Lump Sum

* Includes 12 Lin. Ft. of 1"Φ Rigid Steel Conduit

IN LETTING OF MARCH 5, 1963

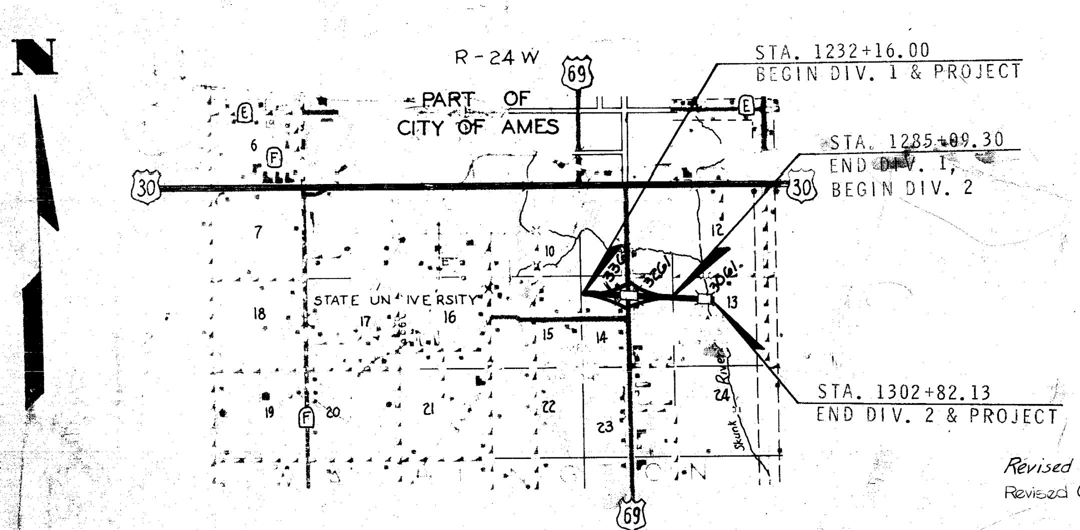
DESIGN	LOCATION			DESCRIPTION	ESTIMATE OF QUANTITIES							
	SECTION	TOWNSHIP	STATION	SIZE AND TYPE	CONCRETE CUBIC YARDS	REINFORCING STEEL LBS.	EXCAVATION -- CUBIC YARDS CLASS 20	CLASS 24		CLASS 10 CHANNEL		REMOVALS
3361	14	WASHINGTON	1249+85	6' X 4' X 254' Reinf. Conc. Box Culv. 30° Skew	204.0	20,743	426					
				TOTALS	204.0	20,743	426					

SPECIFICATIONS.
CONSTRUCTION: Standard Specifications of the Iowa State Highway Commission, Series of 1960, plus current Supplemental Specifications and Special Provisions.

DESIGN STRESSES for the following materials are in accordance with A.A.S.H.O. Standard Specifications, Series of 1961.
Reinforcing Steel in accordance with Section 1.4.12 "Reinforcement" for Intermediate, Hard, or Rail Steel Grade.
Concrete in accordance with Section 1.4.11 f'_c = 3500 p.s.i.
Prestressed Concrete in accordance with Section 1.13.7 f'_c = 5000 psi.
Prestressing Steel in accordance with Section 1.13.7 f'_s = 250,000 psi.
Design stresses for Structural Steel (A-36) to be in accordance with the Bureau of Public Roads Circular Memorandum entitled, "Unit Stresses for A.S.T.M. A-36 Carbon Steel and for Rivets and Bolts", dated August 17, 1962.

These bridges ~~will~~ require Bridge Sign Assemblies furnished and placed by others as specified in Traffic and Highway Planning Instruction No. 11, Revised October 1, 1961.

45-Sheets



LAYOUT
SCALE 1" = 1 MILE

MILEAGE SUMMARY 105-1			
DIV.	LOCATION	LIN. FT.	MILES
	BRIDGE AT STA. 1258+98.85	214.094	.040
	BRIDGE AT STA. 1301+20.00	324.792	.062
	TOTAL		.102

DEPUTY

DIVISION

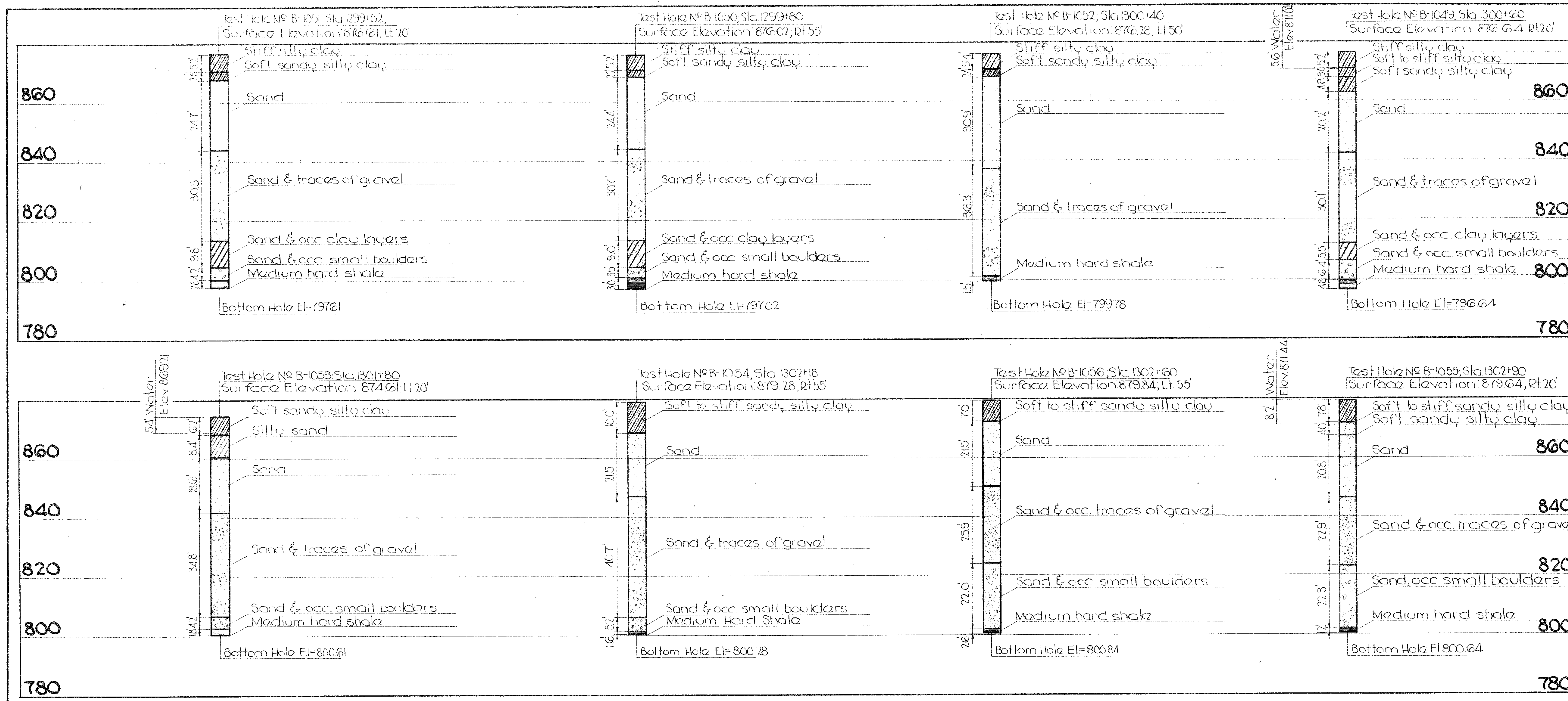
Revised 7-22-63: Sheet 7a of 23 Design 3261 added for corrected footing layout, quantities changed on sheets 1 and 7 of 23.
Revised 6-10-63 Design 3261: Number and weight of bars 5g1 corrected on Sh# 2 & 3 of 23.
Number and weight of bars 5c1 & 5c2-7 corrected on Sh# 6 of 23.
Revised 5-6-63 Design 3061: Structural Steel quantity corrected on sheets 1 & 10
Revised 2-27-63 Design 3061: Structural Carbon Steel designation changed for minor members; Notes on Sheets 1 & 11 changed.

FU-1065(10) APRIL-2/63LET

Story US 30 #7

COUNTY STORY PROJECT NO. FU-1065 (10) FILE NO. 21308

Bench Marks: Nº 23B Sta. 1299+80 I.H.C. B.M. on S.W. wing E.B. Bridge Elev. 891.75
Nº 24B Sta. 1302+60 I.H.C. B.M. on N. Ewing W.B. Bridge Elev. 891.74



S O U N D I N G   D A T A

Dated: 2-14-62

GENERAL NOTES:

These bridges were designed for H20-S16 loading plus an allowance of 19 lb per square foot of roadway for future wearing surface.

Approach fills were not a part of this contract but are to be in place before abutment piles are driven. The Bridge Contractor leveled and shaped the berms to the elevations and dimensions shown in the plans.

The Bridge Contractor cleared the channel to 65 feet on each side of the ℄ survey as indicated by the cross hatched areas on the Situation Plan and Longitudinal Sections, sheet 4. The excavation quantities for the piers were based on the assumption that the channel clearance was completed before the construction of the piers was begun.

The dirt from the channel clearance and footing excavation was deposited in the waste area shown on the General Plan, sheet 2.

The construction of the wing dikes and the remainder of the channel clearance was done by others and was not a part of this contract.

The formed beam guardrail and creosoted posts at the ends of the bridges were to be furnished and placed by others and were not a part of this contract.

A test-load pile was driven at Pier 1 of the Eastbound Lane. For the location and the driving and testing procedure see details on sheet 2. The Bridge Contractor co-operated with the Engineer in the performance of this test and assisted in setting and removing the test beam. The cost of this work was considered incidental to the driving of the footing piles and no separate payment was made for this work or for delays caused by testing.

Untreated piling for pier footings were oak and gumwood.

The bid item "Welded Wire Fabric Retard" included the cost of all labor, excavation, furnishing and driving piling, materials, and other incidental items necessary for the construction of the retard and wingdams. The 1" ϕ and 3/4" ϕ cable was furnished by the I.S.H.C.; see sheet 3.

SPECIFICATIONS:

Design: A.A.S.H.O. Series of 1961 plus U.S.B.P.R. Circular memo dated August 17, 1962, "Unit Stresses for ASTM A-36 Carbon Steel."

Design stresses for:

Reinforcing Steel in accordance with Sec. 1.4.12 "Reinforcement for intermediate, hard, or rail steel grade," A.A.S.H.O.

Concrete in accordance with Sec. 1.4.11 $f'c = 3500$ p.s.i. A.A.S.H.O.

Structural Steel: ~~All structural steel in accordance with U.S. B.P.R. Circular Memo 8-17-62. "Unit stresses for A.S.T.M. A-36 Carbon Steel."~~ Flange and web plates of main and floor beam girders, stringers, bearing stiffeners, and splice plates in accordance with USBPR Circular Memo 8-17-62 "Unit Stresses for A.S.T.M. A36 Carbon Steel." All other steel in accordance with Sec. 1.4.2 A.A.S.H.O.

Construction: I.S.H.C. Standard Specifications Series of 1960, plus current special provisions and supplemental specifications.

TOTAL ESTIMATED QUANTITIES

Items	4-Abuts.	4-Piers	2-Superst.	Totals
Concrete	317.6	324.0	630.4	1,272.0 c.y.
Reinforcing Steel	30,148	39,768	197,528	~~267,444 lb~~ 267,350
Structural Steel			~~519,468~~ 572,310	~~519,468 lb~~ 572,310
Class 10 Channel Excavation				1600 c.y.
Class 20 Excavation	748	140		888 c.y.
Class 21 Excavation		520		520 c.y.
Creosoted Piling	96@35'			3,360 L.F.
Untreated Piling (Oak or Gumwood)		192@35'		6,720 L.F.
~~Aluminum Handrail (℄-℄ End Posts)~~				~~1248.0 L.F.~~
or Steel Handrail (℄-℄ End Posts)				1254.0 L.F.
Granular Backfill	897			897 Tons
Welded Wire Fabric Retard (℄-℄ End Piles - Includes wingdams)				840 L.F.
Porous Backfill	46			46 c.y.

Note: ~~Superstructure reinforcing steel quantity is based on the use of Aluminum Hand~~rail. (See sheet 10.)

Revised 5-6-63: Structural Steel quantity corrected.

Revised 2-27-63: Specifications Note changed to include different carbon steels.

LOCATION:
Story County
T83N R24W
Washington Twp.
Section 13
U.S. Nº 30 over
Skunk River

DESIGN FOR 20° SKEW

DUAL 320'-0 x 30' CONTINUOUS WELDED GIRDER BRIDGES AND WELDED WIRE RETARD

97'-6 End Spans — 125'-0 Interior Span
Concrete Floor & Substructure — Tubular Hand Rail

SOUNDING DATA

Station: 1301+20.00 — Project Nº FU-1065(10)

STORY COUNTY

Iowa State Highway Commission

December 1962 — Sheet 1 of 15

Design Nº 3061 — Story County — File Nº 21508

~~Bench Mark No 23, Sta 1300+91, R.R. spike in E. side 15" Willow, 122' Rt. Elev. = 878.13~~

Bench Marks No 23B Sta. 1299+80 I.H.C. B.M. on S.W. wing E.B. Bridge Elev. 891.75
No 24B Sta. 1302+60 I.H.C. B.M. on N.E. wing W.B. Bridge Elev. 891.74

PILE NOTES FOR TEST LOAD: (REFER TO SKETCH)

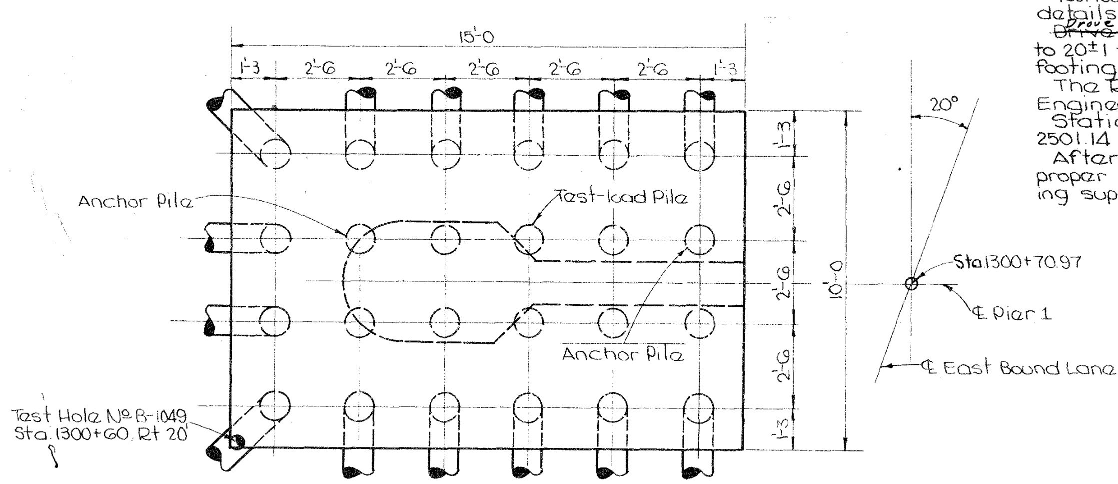
Test loaded one pile only for Pier 1 East Bound Lane. For pile notes and details not shown see Pier Details, sheet 7.

~~Drive~~ Drove all footing pile as shown, except test-load pile. ~~Drive~~ Drove test-load pile to 20±1 ton. Top of anchor piles ~~are to be~~ were 3ft. above bottom of footing. ~~Pile to be test loaded shall be~~ Test load pile was driven without jetting.

The Resident Construction Engineer ~~will~~ notified the Materials Engineer in Ames when test-load pile ~~is~~ was ready for loading.

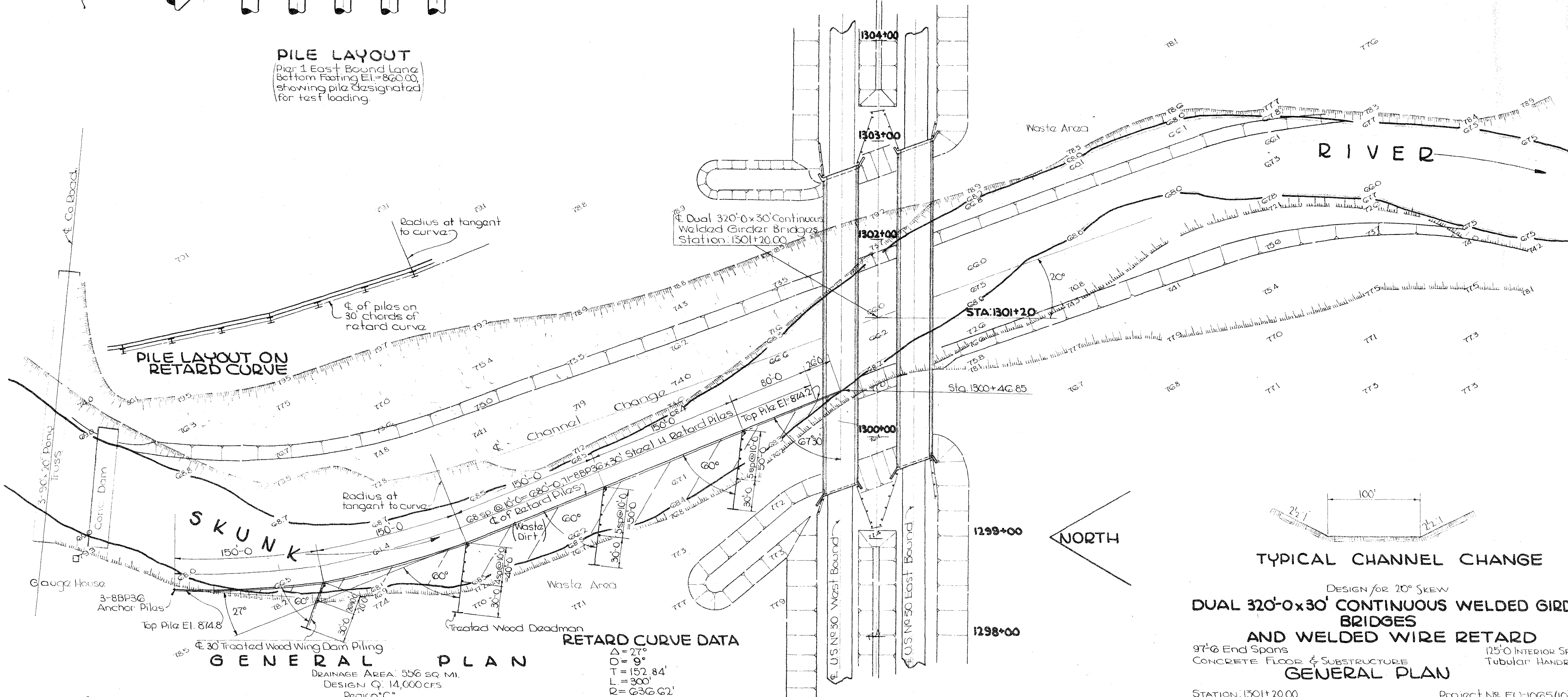
Statically loaded test-load pile to yield point as described in Article 2501.14 of the Standard Specifications.

After testing, the test-load pile and the anchor piles ~~shall be~~ were cut off to proper elevation and ~~shall be~~ left in acceptable condition for footing support.



PILE LAYOUT

(Pier 1 East Bound Lane Bottom Footing El. = 860.00, showing pile designated for test loading.)



GENERAL PLAN

Drainage Area: 556 sq. mi.
Design Q. 14,000 cfs
Region "C"

RETARD CURVE DATA

Δ = 27°
D = 9°
T = 152.84'
L = 300'
R = 636.62'

TYPICAL CHANNEL CHANGE

DESIGN FOR 20° SKEW

DUAL 320'-0 x 30' CONTINUOUS WELDED GIRDER BRIDGES AND WELDED WIRE RETARD

97'-6 End Spans | 125'-0 Interior Span
Concrete Floor & Substructure | Tubular Handrail

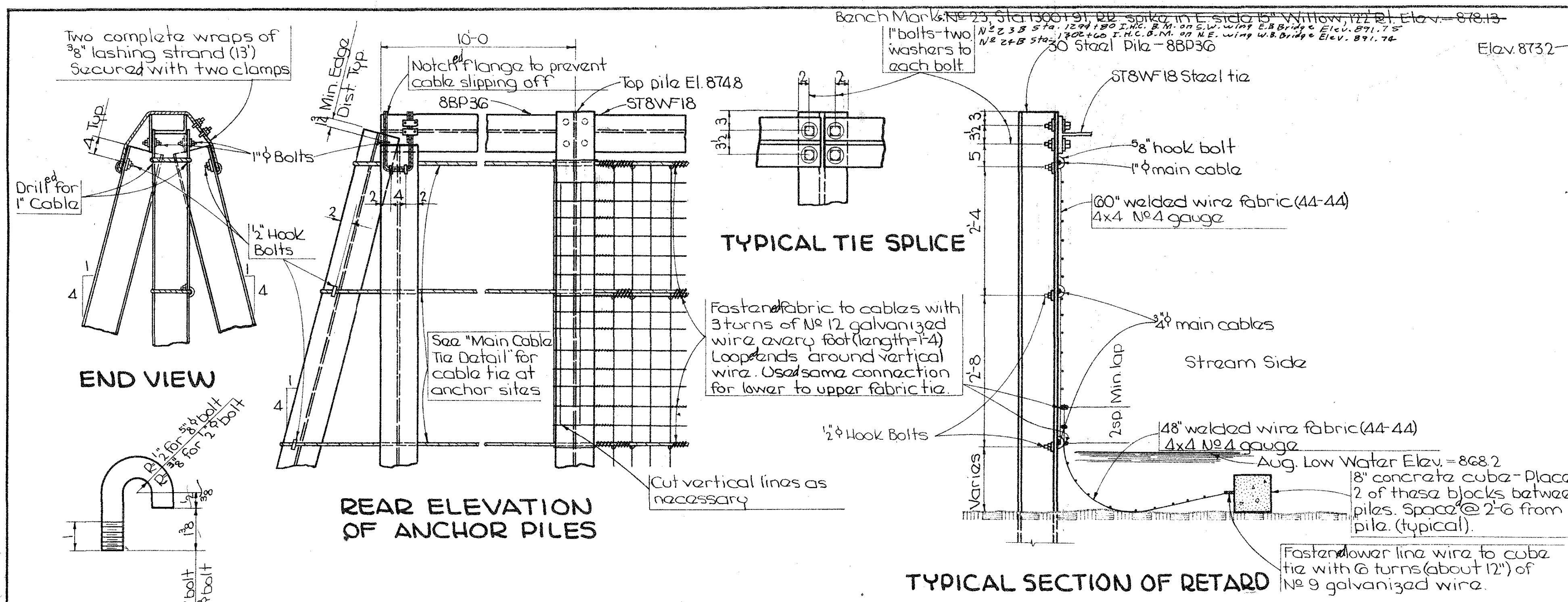
GENERAL PLAN

Station: 1301+20.00 | Project No FU-1065(10)

STORY COUNTY

Iowa State Highway Commission
December 1962 | Sheet 2 of 15

Design No 3061 | Story County | File No 21508



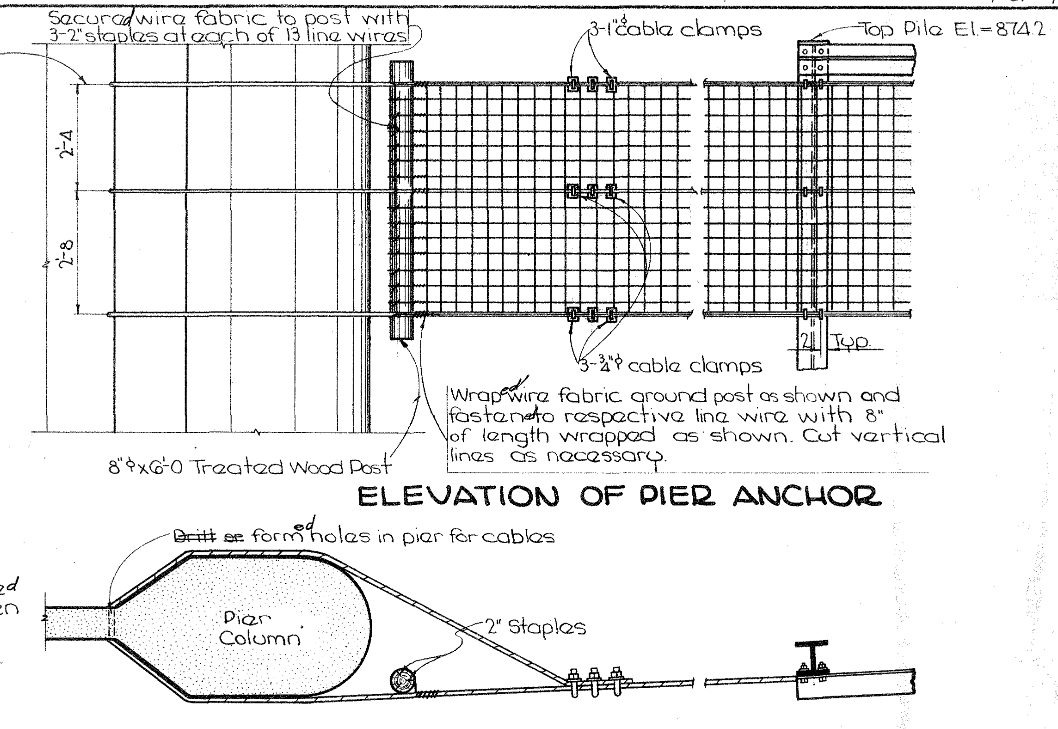
END VIEW

REAR ELEVATION OF ANCHOR PILES

HOOK BOLT DETAIL

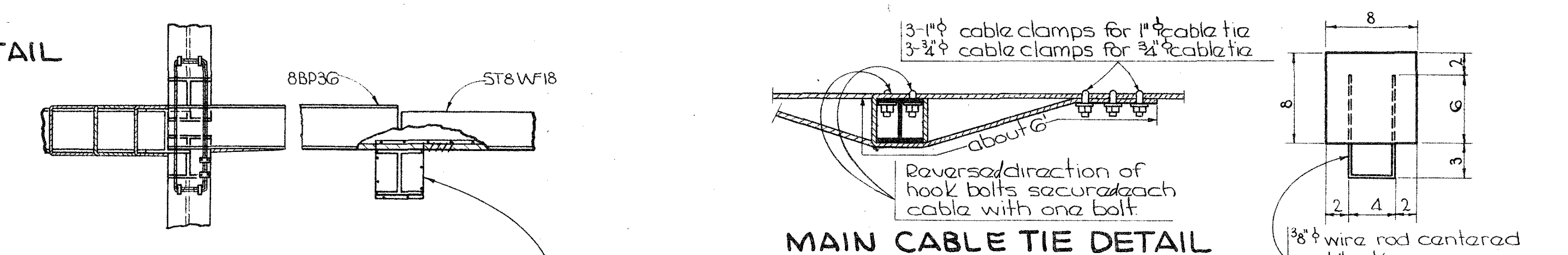
TYPICAL TIE SPLICE

TYPICAL SECTION OF RETARD



ELEVATION OF PIER ANCHOR

PLAN OF PIER ANCHOR



PLAN OF ANCHOR PILES

MAIN CABLE TIE DETAIL

BLOCK WEIGHT DETAIL

RETARD NOTES:

All holes in steel tie ~~are to be field drilled or~~ were field burned.

Fastened steel tie to each pile with four 1"φ bolts. Provided two washers for each bolt.

ST8WF18 Steel ties ~~are to be~~ were furnished in 30' lengths except one 20' length ~~is~~ was required at each end. One 10' section of 8BP36 Steel H-pile ~~is~~ was required for tie on anchor pile end.

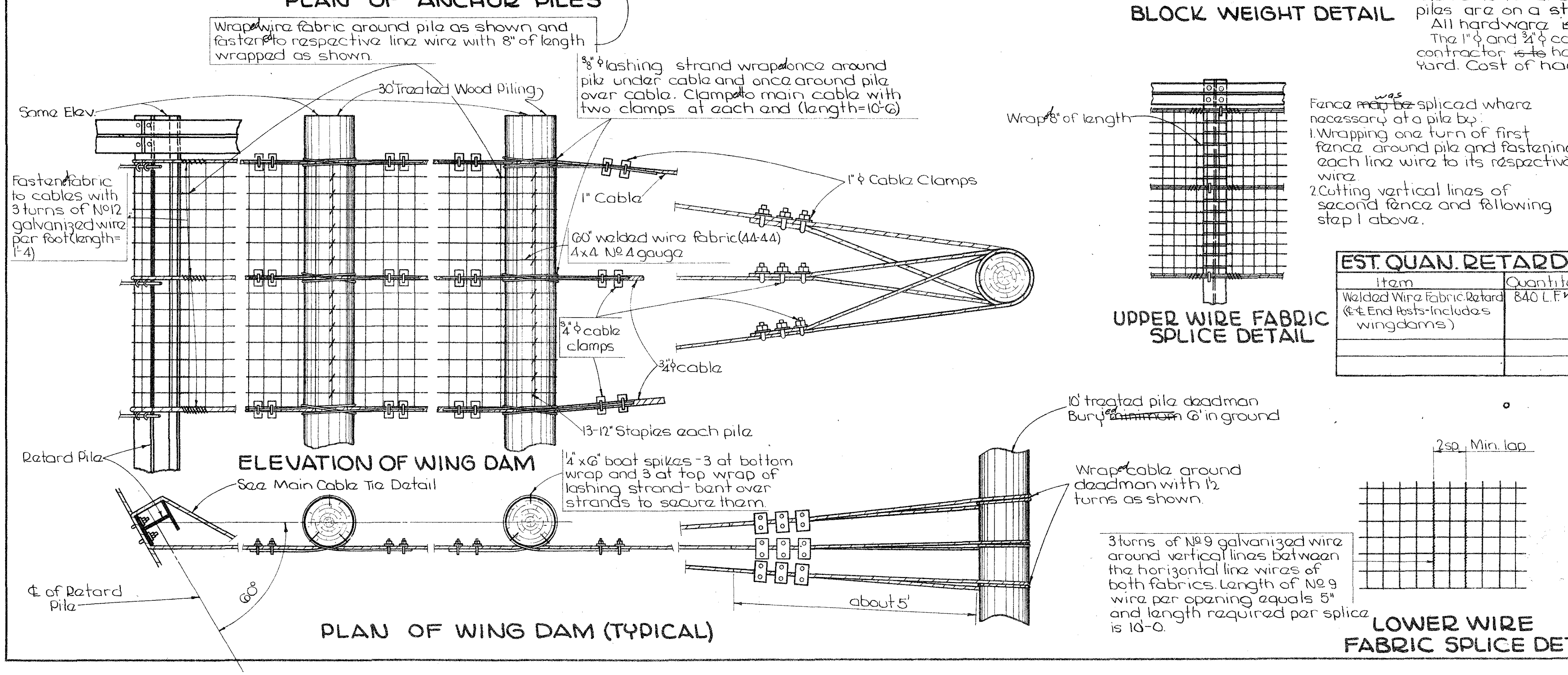
Fastened main cables to piles with two hook bolts per cable at tie splice points and with one hook bolt per cable at intermediate piles. Furnished one washer with each hook bolt.

Main cables ~~are to be~~ run continuously for maximum of nine pile spaces and are fastened as shown.

Steel H piles ~~are to be~~ were driven to full penetration ~~if practicable~~. Top of pile elevations are shown on sheet 1 for end piles. Tops of intermediate piles are on a straight line between tops of end piles.

All hardware is ~~to be~~ was galvanized.

The 1"φ and 3/4"φ cable ~~is to be~~ was furnished by the I.S.H.C. Maintenance Yard at Ames. The contractor ~~is to~~ hauled the cable to site and returned unused cable to Maintenance Yard. Cost of hauling ~~to be~~ was included in price bid for "Welded Wire Fabric Retard."



ELEVATION OF WING DAM

PLAN OF WING DAM (TYPICAL)

UPPER WIRE FABRIC SPLICE DETAIL

LOWER WIRE FABRIC SPLICE DETAIL

EST. QUAN. RETARD	
Item	Quantity
Welded Wire Fabric Retard (& End Posts - Includes wingdams)	840 L.F. ✓

BILL OF MATERIAL FOR WIRE FABRIC RETARD			
ITEM			QUANTITY
ST8WF18 Steel Ties	21@30', 2@20'		670 Lf. ✓
Steel H Piles 8BP36	furnish	71 @ 30'; 1@10'	2140 Lf. ✓
	drive	71 @ 30';	2130 Lf. ✓
Creosoted Piles		16@30'	480 Lf. ✓
60" 44-44 Welded Wire Fabric (approx. length)			890 Lf. ✓
48" " " " " " "			683 Lf. ✓
* 1"φ Main Cable " "			1150 Lf. ✓
* 3/4"φ " " " "			2306 Lf. ✓
1"φ Cable Clamps			200 ~~72~~ ~~136~~ ✓
3/4"φ " "			~~144~~ 208 ✓
3/8"φ Lashing Strand (approx. length)			517 Lf. ✓
1/4"x6" Boat Spikes			288 ✓
5/8"φ Hook Bolts (includes one washer each bolt)			92 ✓
1/2"φ Hook Bolts " " " " "			190 ✓
2" Staples			247 ✓
Treated Wood Deadman			40 Lf. ✓
1"φx3" Bolts (includes two washers each bolt)			274 ✓
8"φx6'-0 Treated Wood Post			6 Lf. ✓
8" Concrete Block Weights			134 ✓
Nº 9 Wire, Galvanized			184 Lf. ✓
Nº 12 Wire, Galvanized			4253 Lf. ✓
3/8"φ Cable Clamps			2 ✓
* Furnished by I.S.H.C. See Retard Notes above			

DESIGN FOR 20° SKEW

DUAL 320'-0 x 30' CONTINUOUS WELDED GIRDER BRIDGES AND WELDED WIRE RETARD

97'-6 End Spans 125'-0 Interior Span
Concrete Floor & substructure Tubular Handrail

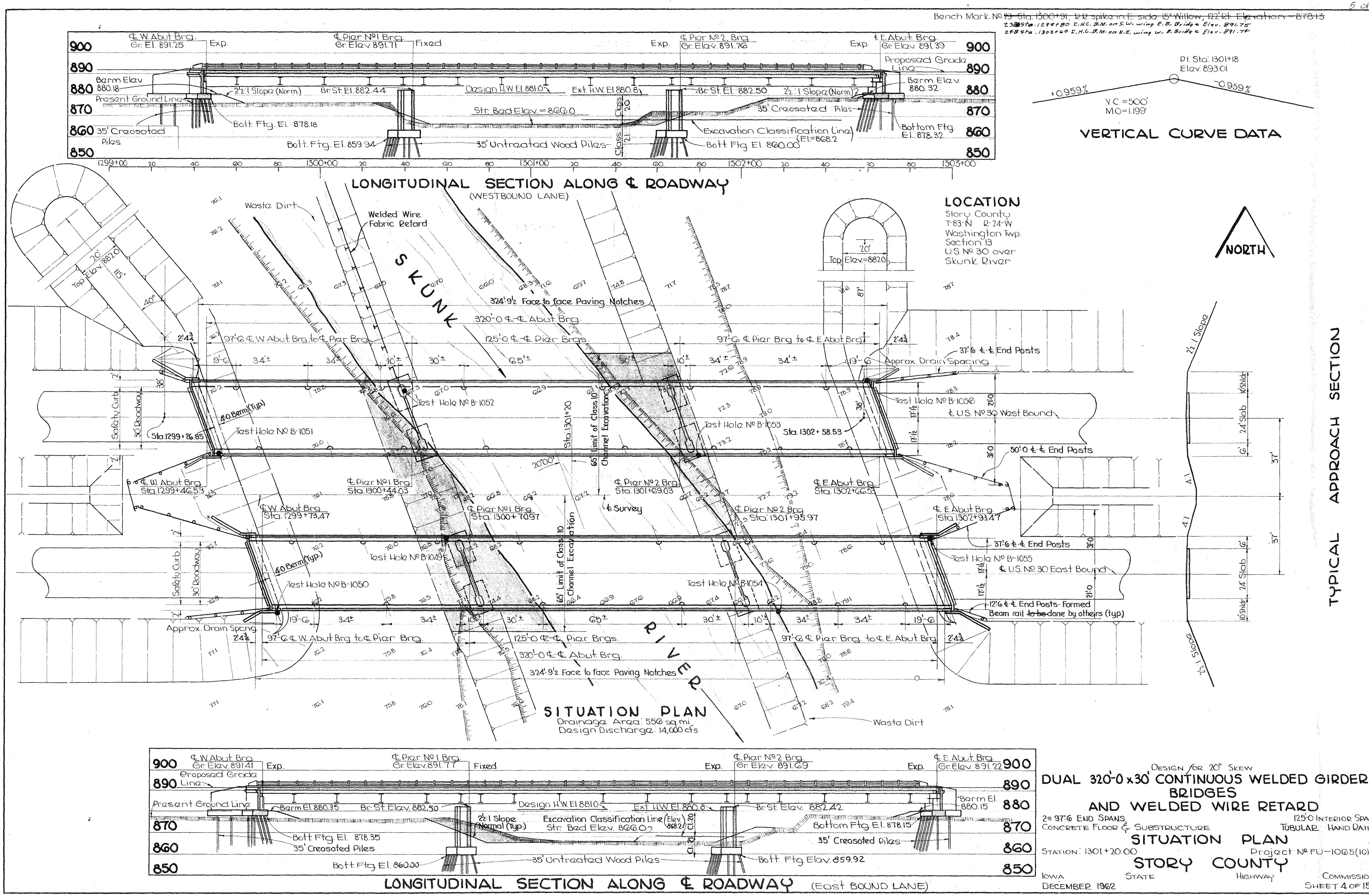
RETARD DETAILS

STATION: 1301+20.00 Project Nº FU-1065(10)

STORY COUNTY

IOWA STATE HIGHWAY COMMISSION
Dec. 1962 SHEET 3 OF 15

DESIGN Nº 3061 STORY CO. FILE Nº 21508



DESIGN FOR 20° SKEW

DUAL 320'-0 x 30' CONTINUOUS WELDED GIRDER BRIDGES AND WELDED WIRE RETARD

2 @ 97'-6 END SPANS | 125'-0 INTERIOR SPAN
CONCRETE FLOOR & SUBSTRUCTURE | TUBULAR HAND RAIL

SITUATION PLAN

STATION: 1301+20.00 | Project No FU-1065(10)

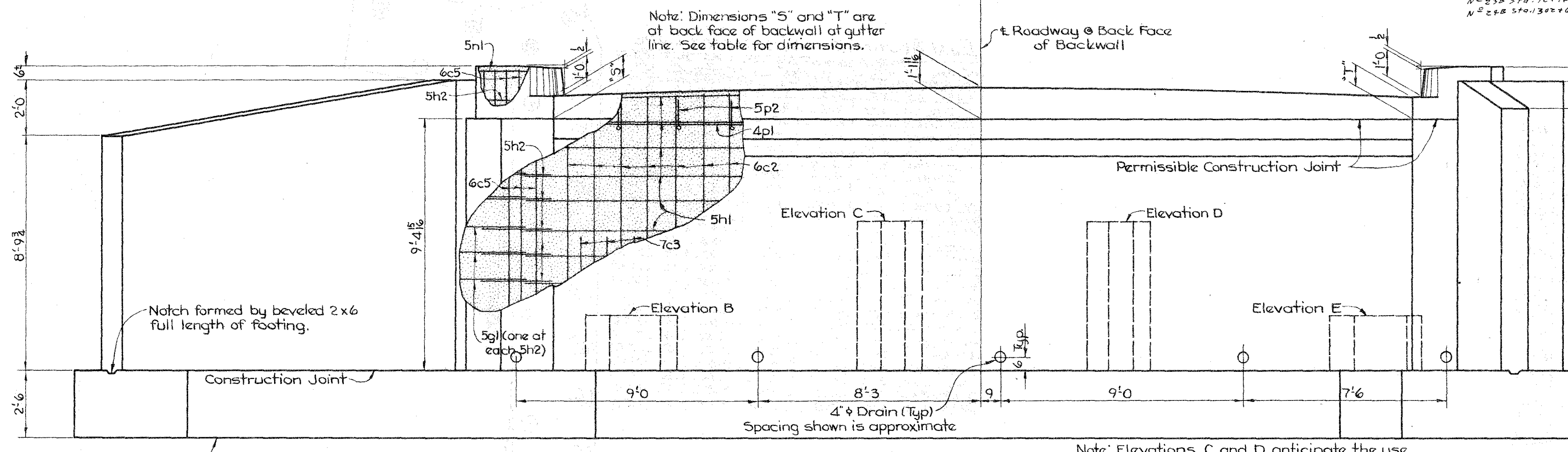
STORY COUNTY

IOWA STATE HIGHWAY COMMISSION
DECEMBER 1962 | SHEET 4 OF 15

DESIGN No 3061 | STORY COUNTY | FILE No 21508

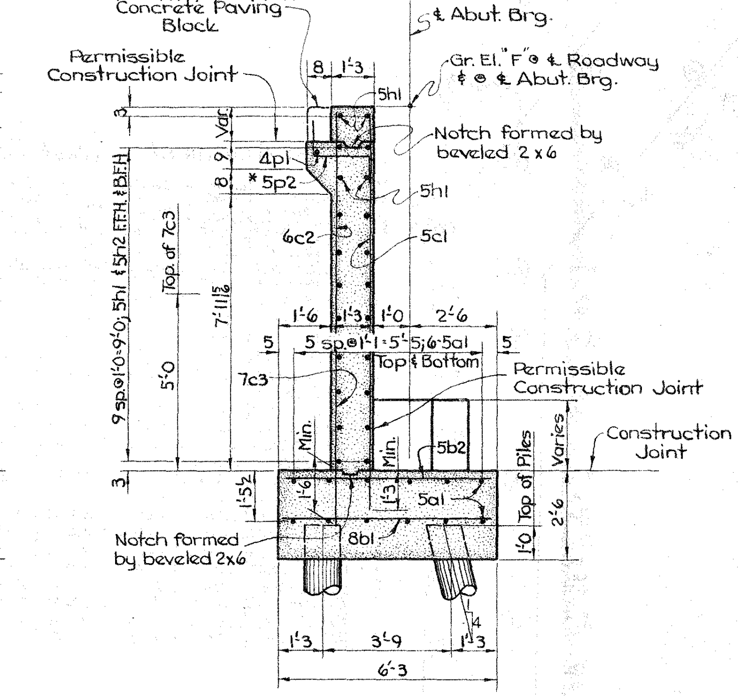
TRACED BY: STEFANI | CHECKED BY: JPN

Bench Mark Nº 23 Sta. 1300+91 122' Rt. Set R.R. Spk. in E. Side of 15" Willow on W. Side of River El. 878.13



REAR ELEVATION

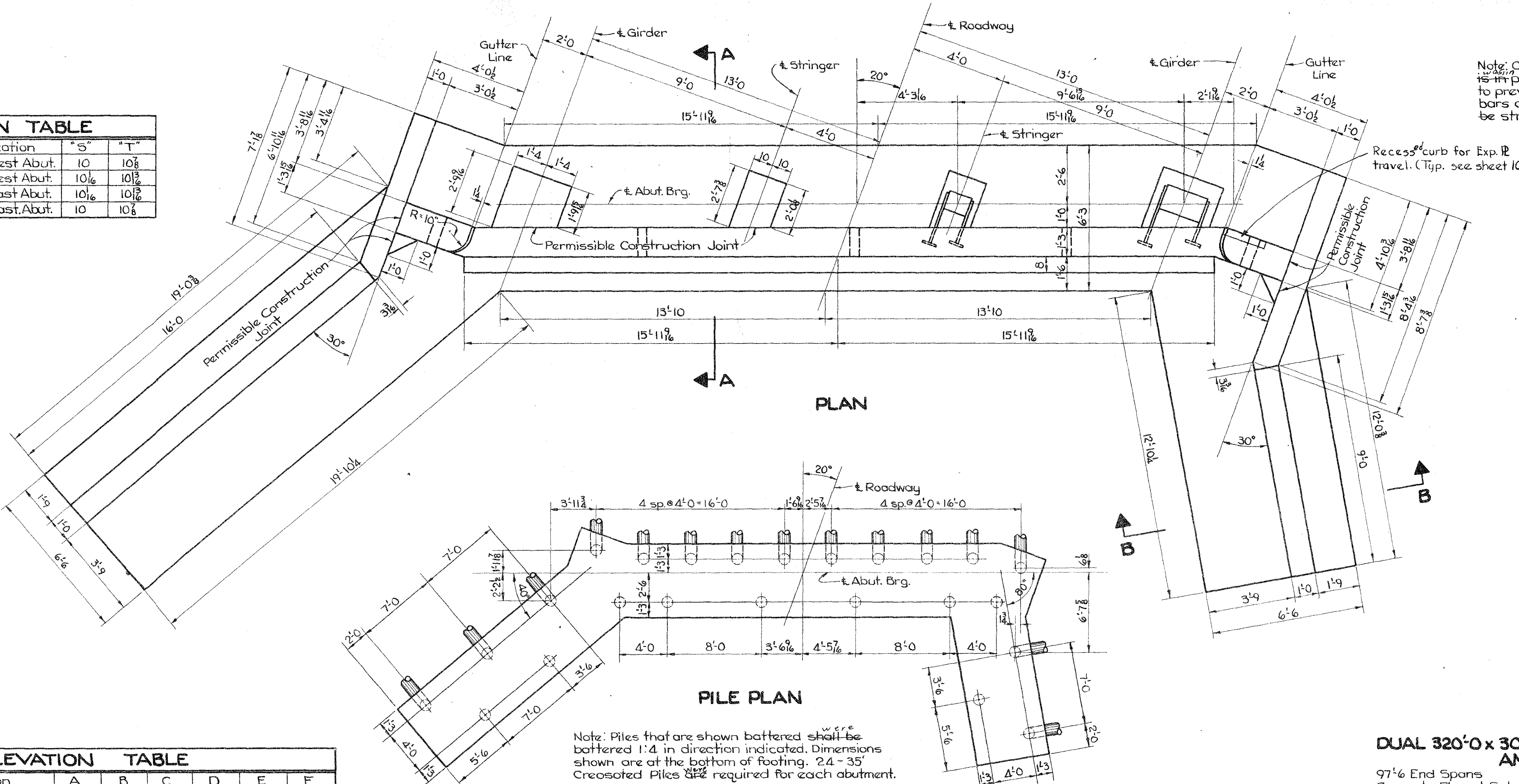
Note: Elevations C and D anticipate the use of 2-1/16" shims under masonry plate and the allowance of 1/16" for paint and canvas.



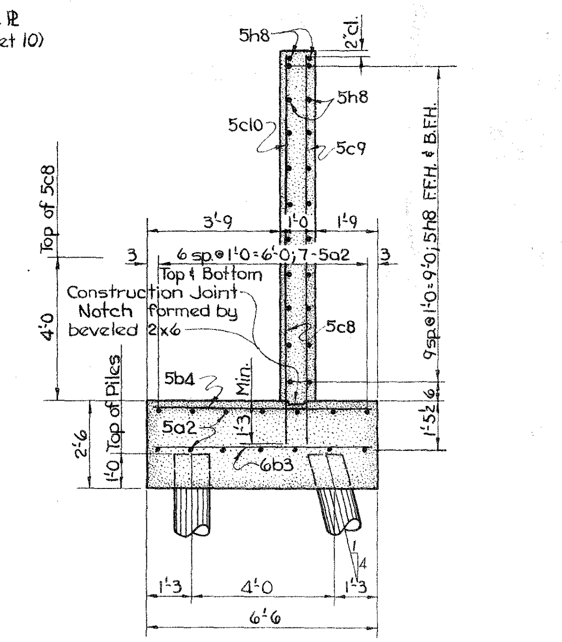
SECTION A-A

Note: Concrete paving block shall be placed after backwall is in place. Bend down 5p2 bars and line notch with tarpaper to prevent bond. Remove paving block and straighten 5p2 bars as shown before paving is placed. *5p2 bars are to be structural grade steel.

DIMENSION TABLE		
Abutment Location	"S"	"T"
Westbound Lane ~ West Abut.	10	10 7/8
Eastbound Lane ~ West Abut.	10 1/16	10 13/16
Westbound Lane ~ East Abut.	10 1/16	10 13/16
Eastbound Lane ~ East. Abut.	10	10 7/8



PLAN



SECTION B-B

PILE PLAN

Note: Piles that are shown battered were battered 1:4 in direction indicated. Dimensions shown are at the bottom of footing. 24 - 35' Creosoted Piles were required for each abutment.

ELEVATION TABLE						
Abutment Location	A	B	C	D	E	F
Westbound Lane ~ West Abut.	878.18	882.68	886.16	886.18	882.74	891.25
Eastbound Lane ~ West Abut.	878.35	882.85	886.32	886.34	882.90	891.41
Westbound Lane ~ East Abut.	878.32	882.82	886.30	886.32	882.88	891.39
Eastbound Lane ~ East Abut.	878.15	882.65	886.13	886.15	882.72	891.22

Design for 20° Skew

DUAL 320'-0 x 30' CONTINUOUS WELDED GIRDER BRIDGES AND WELDED WIRE RETARD

97'-6 End Spans
Concrete Floor & Substructure

125'-0 Interior Span
Tubular Handrail

ABUTMENT DETAILS

Station: 1301 + 20.00

Project Nº FU-1065(10)

STORY COUNTY

Iowa State Highway Commission

December 1962

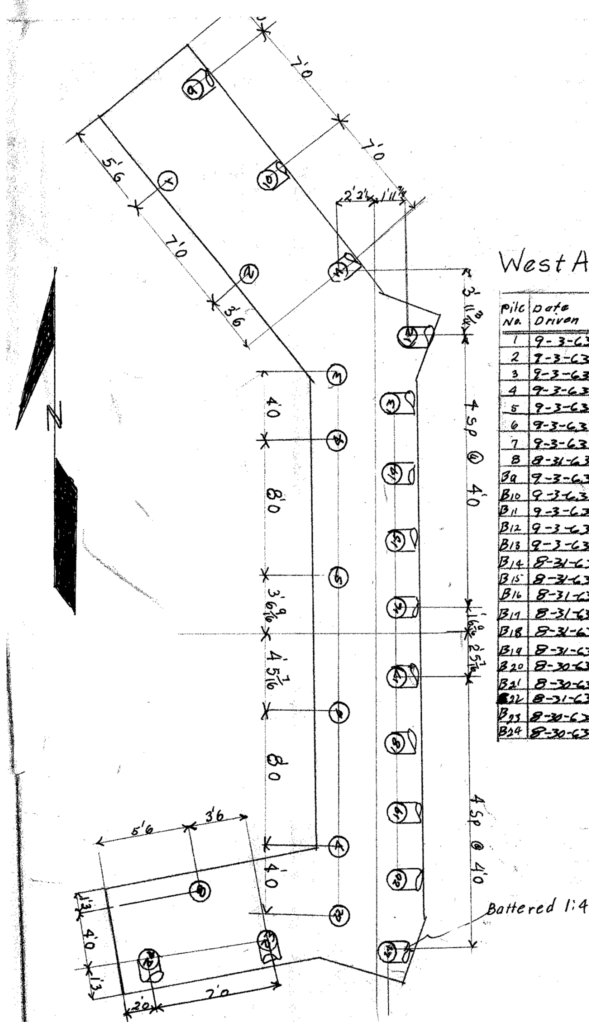
Sheet 5 of 15

Design Nº 3061

Story County

File Nº 21508

Checked by: CED

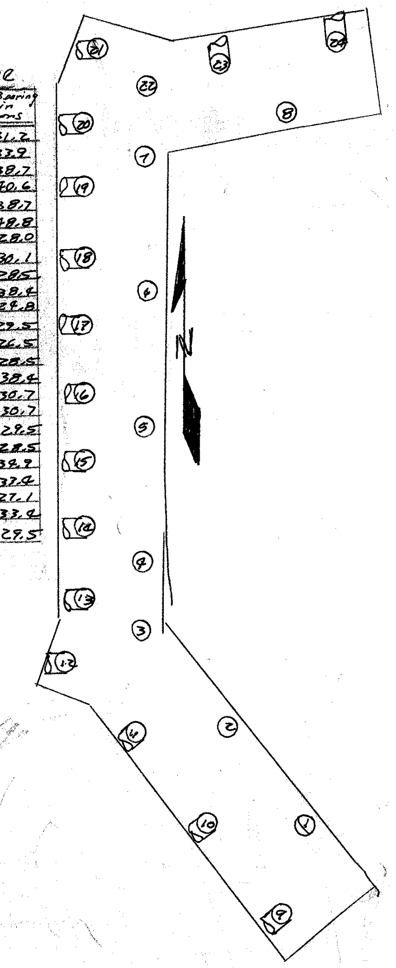


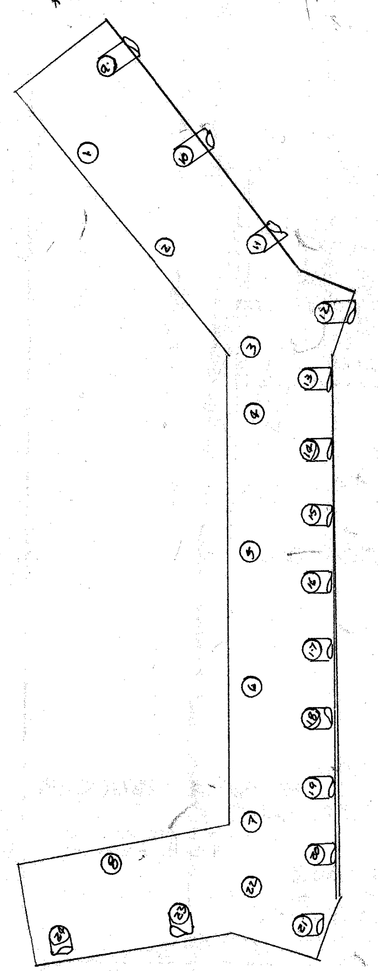
West Abutment West Bound Lane

Pile No.	Date Driven	Length in leads nearest ft.	Length cut off nearest .1 ft.	Length in Structure	Ave. Pen last 5 blows (inches)	Drop in feet	Bearing in tons
1	9-3-63	35	0.6	34.4	1.15	8	27.1
2	9-3-63	35	1.0	34.0	0.835	8	33.2
3	9-3-63	35	0.7	34.3	0.725	8	31.9
4	9-3-63	35	13.2	21.8	0	6	R
5	9-3-63	35	0.8	34.2	1.025	8	29.5
6	9-3-63	35	1.1	33.9	0.75	8	36.9
7	9-3-63	35	0.7	34.3	0.90	8	32.5
8	8-31-63	35	1.1	33.9	1.00	8	30.1
B9	9-3-63	35	0.8	34.2	1.35	8	23.2
B10	9-3-63	35	0.9	34.1	1.00	8	28.5
B11	9-3-63	35	1.1	33.9	1.00	8	28.5
B12	9-3-63	35	0.8	34.2	0.90	8	30.7
B13	9-3-63	35	1.0	34.0	0.90	8	30.7
B14	8-31-63	35	0.9	34.1	0.95	8	29.5
B15	8-31-63	35	1.1	33.9	0.95	8	29.5
B16	8-31-63	35	1.3	33.7	0.80	8	33.4
B17	8-31-63	35	1.3	33.7	0.65	8	38.4
B18	8-31-63	35	1.2	33.8	0.85	8	32.0
B19	8-31-63	35	1.1	33.9	0.85	8	32.0
B20	8-30-63	35	1.3	33.7	1.05	8	27.4
B21	8-30-63	35	1.3	33.7	1.20	8	24.8
B22	8-31-63	35	1.2	33.8	0.80	8	35.3
B23	8-30-63	35	1.2	33.8	0.80	8	33.4
B24	8-30-63	35	1.2	33.8	0.95	8	29.5

East Abutment West Bound Lane

Pile No.	Date Driven	Length in leads nearest ft.	Length cut off nearest .1 ft.	Length in Structure	Ave. Pen last 5 blows (inches)	Drop in feet	Bearing in tons
1	9-17-63	35	0.7	34.3	0.95	8	31.2
2	9-17-63	35	0.8	34.2	0.85	8	33.9
3	9-17-63	35	1.1	33.9	0.70	8	38.7
4	9-17-63	35	0.3	34.7	0.65	8	40.6
5	9-17-63	35	0.7	34.3	0.70	8	38.7
6	9-17-63	35	3.0	32.0	0.50	8	48.8
7	9-18-63	35	0.3	34.7	1.10	8	28.0
8	9-18-63	35	0.8	34.2	1.00	8	30.1
B9	9-17-63	35	0.9	34.1	1.00	8	28.5
B10	9-17-63	35	0.9	34.1	0.65	8	38.4
B11	9-17-63	35	0.7	34.3	1.20	8	24.8
B12	9-17-63	35	0.8	34.2	0.95	8	29.5
B13	9-17-63	35	0.7	34.3	1.10	8	26.5
B14	9-17-63	35	0.5	34.5	1.00	8	28.5
B15	9-17-63	35	1.3	33.7	0.65	8	38.4
B16	9-17-63	35	0.7	34.3	0.90	8	30.7
B17	9-17-63	35	0.5	34.5	0.90	8	30.7
B18	9-18-63	35	0.6	34.4	0.95	8	29.5
B19	9-18-63	35	0.6	34.4	1.00	8	28.5
B20	9-18-63	35	1.0	34.0	0.75	8	34.9
B21	9-18-63	35	0.9	34.1	0.80	8	33.4
22	9-18-63	35	0.8	34.2	1.15	8	27.1
B23	9-18-63	35	0.9	34.1	0.80	8	33.4
B24	9-18-63	35	0.8	34.2	0.95	8	29.5





West Abutment East Bound Lane

Pile No.	Date Driven	Length in leads nearest ft.	Length cut off nearest .1 ft.	Length in Structure	Ave. Pen last 5 blows (inches)	Drop in feet	Bearing in tons
1	8-29-63	35	1.4	33.6	0.90	8	32.5
2	8-29-63	35	1.3	33.7	1.00	8	30.1
3	8-29-63	35	1.3	33.7	0.75	8	36.9
4	8-28-63	35	2.0	33.0	1.05	8	29.0
5	8-28-63	35	1.9	33.1	0.95	8	31.2
6	8-28-63	35	1.3	33.7	1.20	10	32.8
7	8-29-63	35	0.6	34.4	0.70	8	38.7
8	8-29-63	35	13.0	22.0	R	10	—
B9	8-29-63	35	1.3	33.7	0.85	8	32.0
B10	8-29-63	35	1.9	38.1	0.55	8	42.7
B11	8-29-63	35	3.1	31.9	0.70	8	36.6
B12	8-28-63	35	1.4	33.6	0.70	8	36.6
B13	8-28-63	35	1.5	33.5	0.75	8	34.9
B14	8-28-63	35	1.5	33.5	0.55	8	42.7
B15	8-28-63	35	1.5	33.5	0.65	8	38.4
B16	8-29-63	35	1.1	33.9	0.80	8	33.4
B17	8-30-63	35	1.1	33.9	0.95	8	29.5
B18	8-28-63	35	1.4	33.6	0.65	8	38.4
B19	8-28-63	35	1.3	33.7	0.60	8	40.5
B20	8-29-63	35	1.1	33.9	0.75	8	34.9
B21	8-29-63	35	1.2	33.8	1.20	8	24.8
22	8-29-63	35	0.8	34.2	0.85	8	33.9
B23	8-29-63	35	1.2	33.8	0.70	8	36.6
B24	8-29-63	35	1.2	33.8	0.80	8	33.4

35 ft. Piles Creosote
Type hammer - Gravity
Gross Weight - 5090
weight of pile - ~~1388~~ 1520
I.H.C. hammer No. 289
Effective weight - 5080
T.H.C. cap No. - 168
Weight of cap - 1050

Formula used - $P = \frac{3wH}{0.35+s} \times \frac{w}{w+M}$ Vert.

$P = \frac{(3)(2.54)(8)}{0.35+s} \times \frac{5090}{7650}$ (~~7588~~)

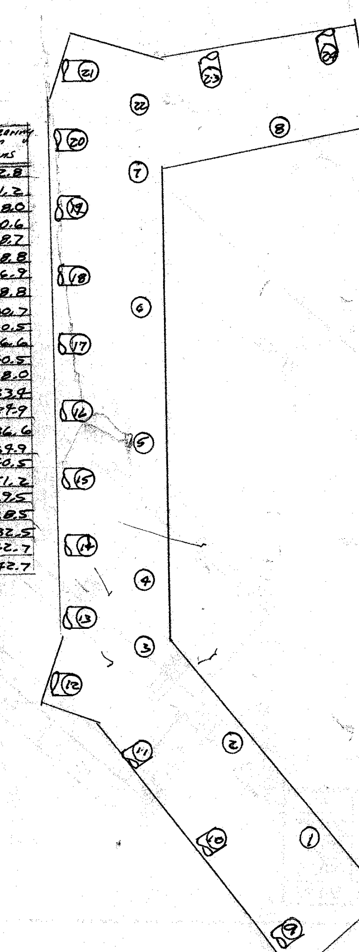
$P = \frac{60.96}{s+0.35} \times 0.666$ (0.676)

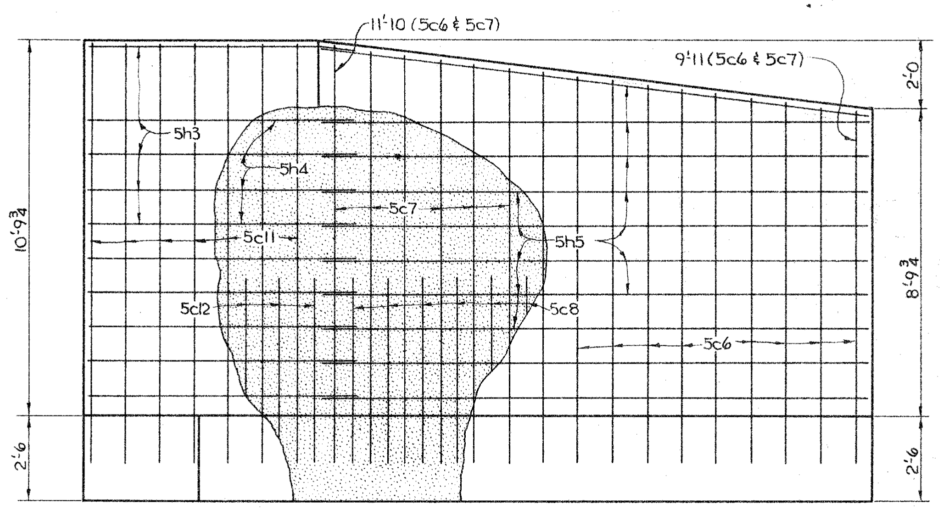
$P = \frac{40.60}{s+0.35}$ (~~41.21~~) Vert.

(") 0.996 Batt. 1:4

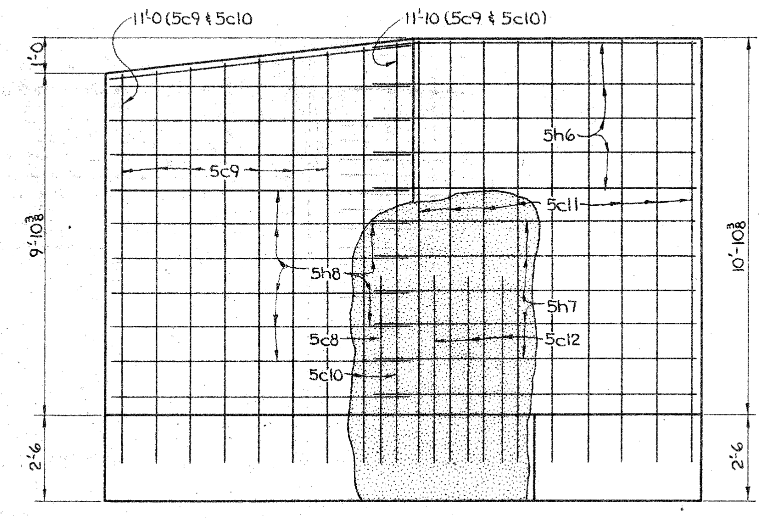
East Abutment East Bound Lane

Pile No.	Date Driven	Length in leads nearest ft.	Length cut off nearest .1 ft.	Length in Structure	Ave. Pen last 5 blows (inches)	Drop in feet	Bearing in tons
1	9-16-63	35	0.6	34.4	0.60	8	42.8
2	9-16-63	35	0.9	34.1	0.95	8	31.2
3	9-16-63	35	0.8	34.2	1.10	8	28.0
4	9-16-63	35	0.8	34.2	0.65	8	40.6
5	9-16-63	35	0.8	34.2	0.70	8	38.7
6	9-16-63	35	0.9	34.1	0.50	8	48.8
7	9-17-63	35	0.7	34.3	0.75	8	36.9
8	9-17-63	35	1.0	34.0	0.50	8	48.8
B9	9-16-63	35	0.9	34.1	0.90	8	30.7
B10	9-16-63	35	1.1	33.9	0.60	8	40.5
B11	9-16-63	35	1.0	34.0	0.70	8	36.6
B12	9-16-63	35	1.3	33.7	0.60	8	40.5
B13	9-16-63	35	1.1	33.9	0.45	8	48.0
B14	9-16-63	35	1.0	34.0	0.80	8	33.4
B15	9-16-63	35	0.9	34.1	0.75	8	34.9
B16	9-16-63	35	0.9	34.1	0.70	8	36.6
B17	9-16-63	35	0.9	34.1	0.75	8	34.9
B18	9-16-63	35	0.9	34.1	0.60	8	40.5
B19	9-16-63	35	0.8	34.2	0.40	8	51.2
B20	9-17-63	35	0.5	34.5	0.95	8	29.5
B21	9-17-63	35	0.9	34.1	1.00	8	28.5
22	9-17-63	35	0.7	34.3	0.90	8	32.5
B23	9-17-63	35	1.1	33.9	0.55	8	42.7
B24	9-17-63	35	1.3	33.7	0.55	8	42.7

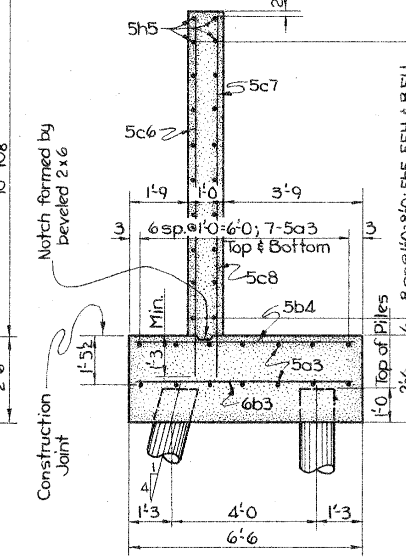




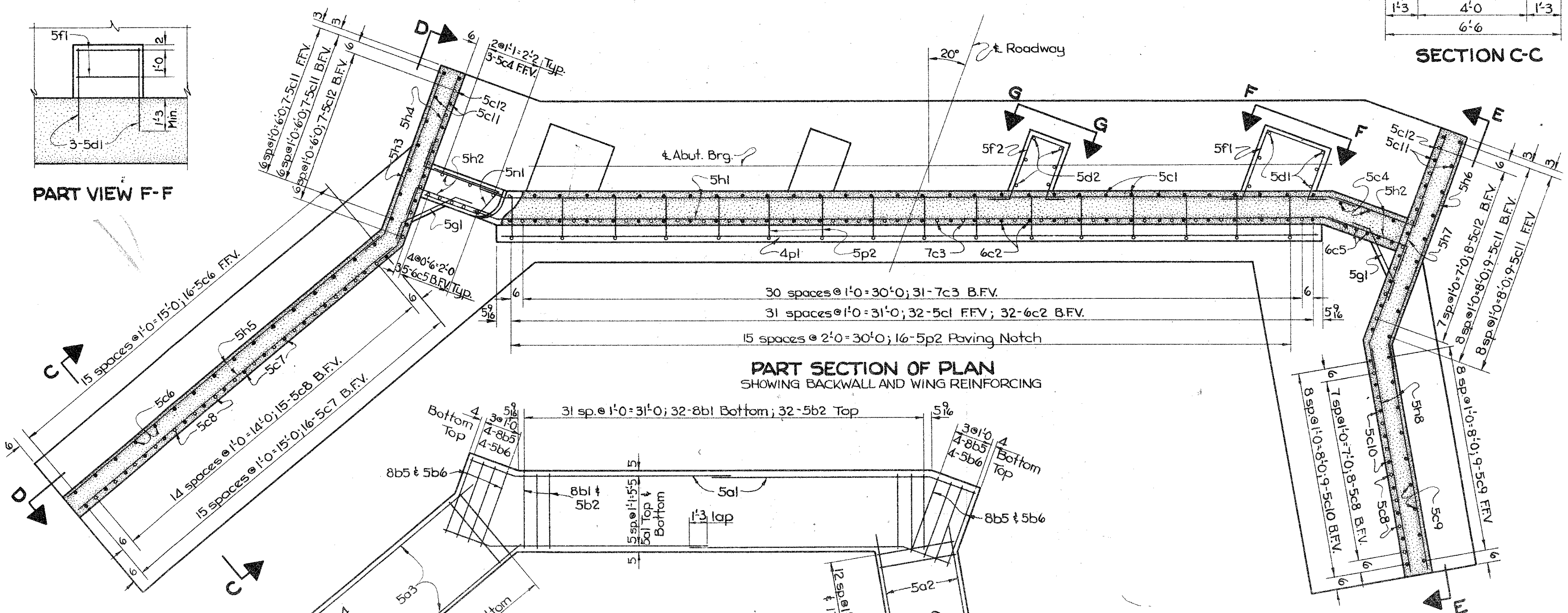
VIEW D-D



VIEW E-E



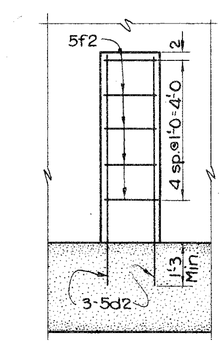
SECTION C-C



PART VIEW F-F

PART SECTION OF PLAN
SHOWING BACKWALL AND WING REINFORCING

FOOTING REINFORCING



PART VIEW G-G

ABUTMENT NOTES:

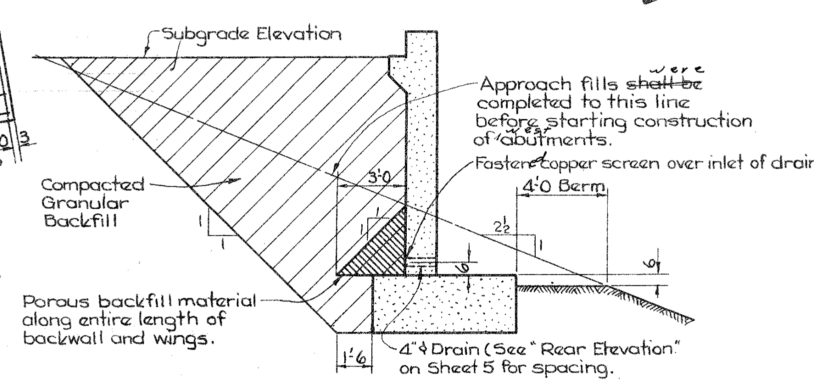
All exposed corners of 90° or sharper ~~are~~ were ~~to be~~ filleted with a ¾" dressed and beveled strip.

Minimum clear distance from face of concrete to near reinforcing bar is ~~to be~~ 2" unless otherwise noted or shown.

The Bridge Contractor ~~is to~~ backfilled abutments between wings to subgrade elevation with granular backfill complying with Section 4133 of the Standard Specifications.

Piling ~~shall~~ was ~~be~~ driven to full penetration, if practicable, but to not less than 20 ton nor more than 40 ton bearing value.

The porous backfill material ~~to be~~ used along the backwall and wings shall complied with Section 4131 of the Standard Specifications.

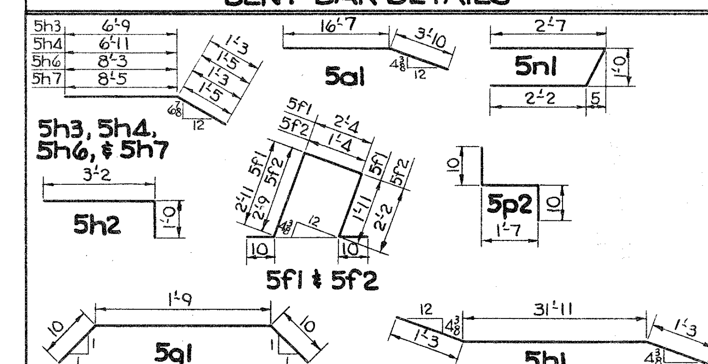


SECTION SHOWING SPECIAL BACKFILL

Note: Excavation outside of the limits shown ~~shall~~ was ~~also be~~ backfilled with granular backfill but at the Contractor's expense.

REINFORCING STEEL ~ ONE ABUTMENT					
Bar	Location	Shape	№	Length	Weight
5a1	Footing, Top & Bottom, Longitudinal		24	20'-5	511
5a2	Wing Footing, Top & Bottom, Longitudinal		14	13'-8	199
5a3	Wing Footing, Top & Bottom, Longitudinal		14	20'-8	302
8b1	Footing, Bottom, Transverse		32	5'-11	505
5b2	Footing, Top, Transverse		32	5'-11	197
6b3	Wing Footing, Bottom, Transverse		33	6'-2	306
5b4	Wing Footing, Top, Transverse		33	6'-2	212
8b5	Footing, Bottom, Transverse		8	6'-3	133
5b6	Footing, Top, Transverse		8	6'-3	52
5c1	Backwall, F.F.V.		32	11'-8	389
6c2	Backwall, B.F.V.		32	11'-11	573
7c3	Backwall, B.F.V.		31	6'-6	412
5c4	Backwall, F.F.V.		6	12'-4	77
6c5	Backwall, B.F.V.		10	12'-7	189
5c6	Long Wing, F.F.V.		16	Varies	181
5c7	Long Wing, B.F.V.		16	Varies	181
5c8	Both Wings, B.F.V.		23	5'-3	126
5c9	Short Wing, F.F.V.		9	Varies	107
5c10	Short Wing, B.F.V.		9	Varies	107
5c11	Both Wings, F.F.V. & B.F.V.		32	11'-11	398
5c12	Both Wings, B.F.V.		15	5'-3	82
5d1	Step, Girder Bearing, Vertical		12	3'-2	40
5d2	Step, Floor Beam Bearing, Vertical		12	6'-7	82
5f1	Step, Girder Bearing, Horizontal		4	8'-6	35
5f2	Step, Floor Beam Bearing, Horizontal		10	7'-7	79
5g1	Backwall & Wing Fillet		20	3'-5	71
5h1	Backwall, F.F.H. & B.F.H.		22	34'-5	790
5h2	Backwall, F.F.H. & B.F.H.		44	4'-2	191
5h3	Long Wing, F.F.H.		10	8'-0	83
5h4	Long Wing, B.F.H.		10	8'-4	87
5h5	Long Wing, B.F.H. & F.F.H.		20	15'-9	329
5h6	Short Wing, F.F.H.		11	9'-6	109
5h7	Short Wing, B.F.H.		11	9'-10	113
5h8	Short Wing, B.F.H. & F.F.H.		22	8'-9	201
5n1	Backwall, Curb, Horizontal		2	6'-1	13
4p1	Backwall, Paving Notch, Horizontal		1	31'-7	21
5p2	Backwall, Paving Notch, Vertical		16	3'-3	54
	Total				7537 lbs.

BENT BAR DETAILS



Note: All dimensions are out to out.

CONCRETE PLACEMENT QUANTITIES ~ ONE ABUT.	
Footing	40.5
Wings	15.6
Bearing Seats & Backwall below Construction Joint	20.4
Backwall above Construction Joint	2.1
Paving Block	0.8
Total	79.4 c.y.

ESTIMATED QUANTITIES ~ 4 ABUTMENTS

Item	Quantity
Concrete	317.6 c.y.
Reinforcing Steel	30,148 lbs.
Creosoted Piling 96 @ 35'	3360 l.f.
Class 20 Excavation	748 c.y.
Granular Backfill	897 tons
Porous Backfill	46 c.y.

Design for 20° Skew

DUAL 320'-0 x 30' CONTINUOUS WELDED GIRDER BRIDGES AND WELDED WIRE RETARD

97'-6 End Spans
Concrete Floor & Substructure

125'-0 Interior Span
Tubular Handrail

ABUTMENT DETAILS

Station: 1301 + 20.00

Project № FU-1065(10)

STORY COUNTY

Iowa State Highway Commission

December 1962

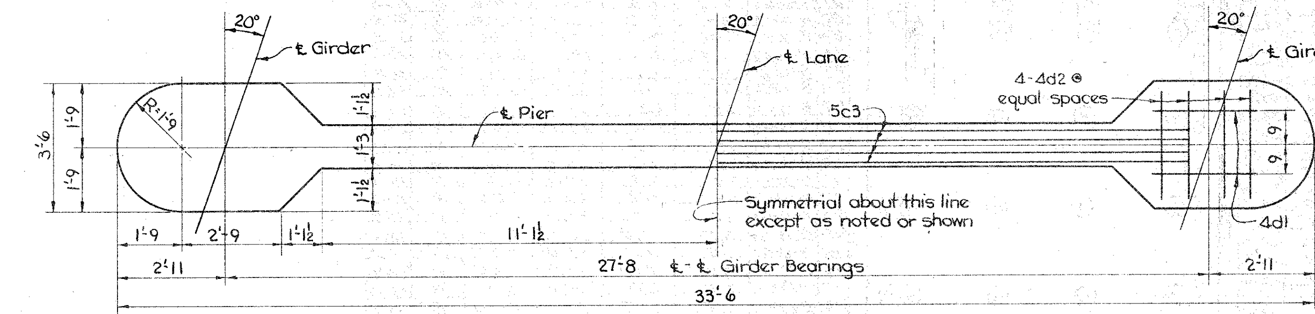
Sheet 6 of 15

Design № 3061

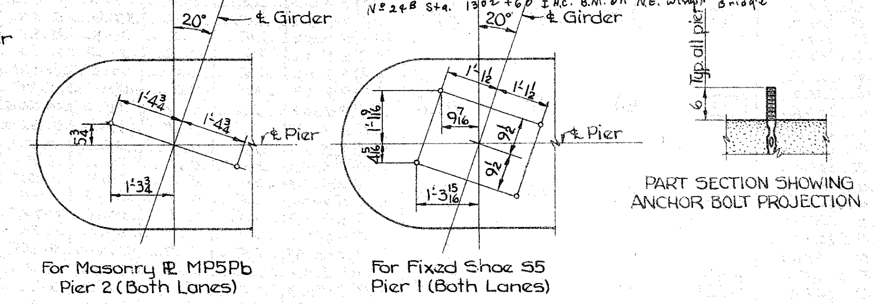
Story County

File № 21508

~~Bench Mark №23: Sta. 1300+91, 122' Rt. Set RR Spk in E. Side of 15" Willow on W. Side of River: El. 878.13~~ El. 891.75 El. 891.74



TOP VIEW

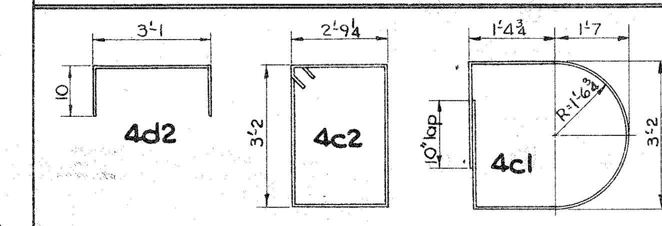


ANCHOR BOLT SETTING DETAILS

PART SECTION SHOWING ANCHOR BOLT PROJECTION

REINFORCING STEEL ~ ONE PIER					
Bar	Location	Shape	№	Length	Weight
10a1	Footing, Longitudinal	——	20	14'-8	1262
10a2	Footing, Transverse	——	30	9'-8	1248
10a3	Footing, Outside Corners	——	8	6'-6	224
10b1	Column Dowels	——	42	5'-0	904
5b2	Diaphragm Dowels	——	28	3'-0	88
10b3	Column, Vertical	——	42	18'-9	3389
5b4	Diaphragm, Vertical	——	48	18'-8	935
4c1	Column Hoops		40	11'-7	309
4c2	Column Hoops		40	12'-6	334
5c3	Diaphragm, Horizontal	——	44	26'-6	1216
4d1	Column, Top, Longitudinal	——	4	3'-0	8
4d2	Column, Top, Transverse		8	4'-8	25
	Total				9942 lbs.

BENT BAR DETAILS



Note: All dimensions are out to out. Radii are to ℄ bar.

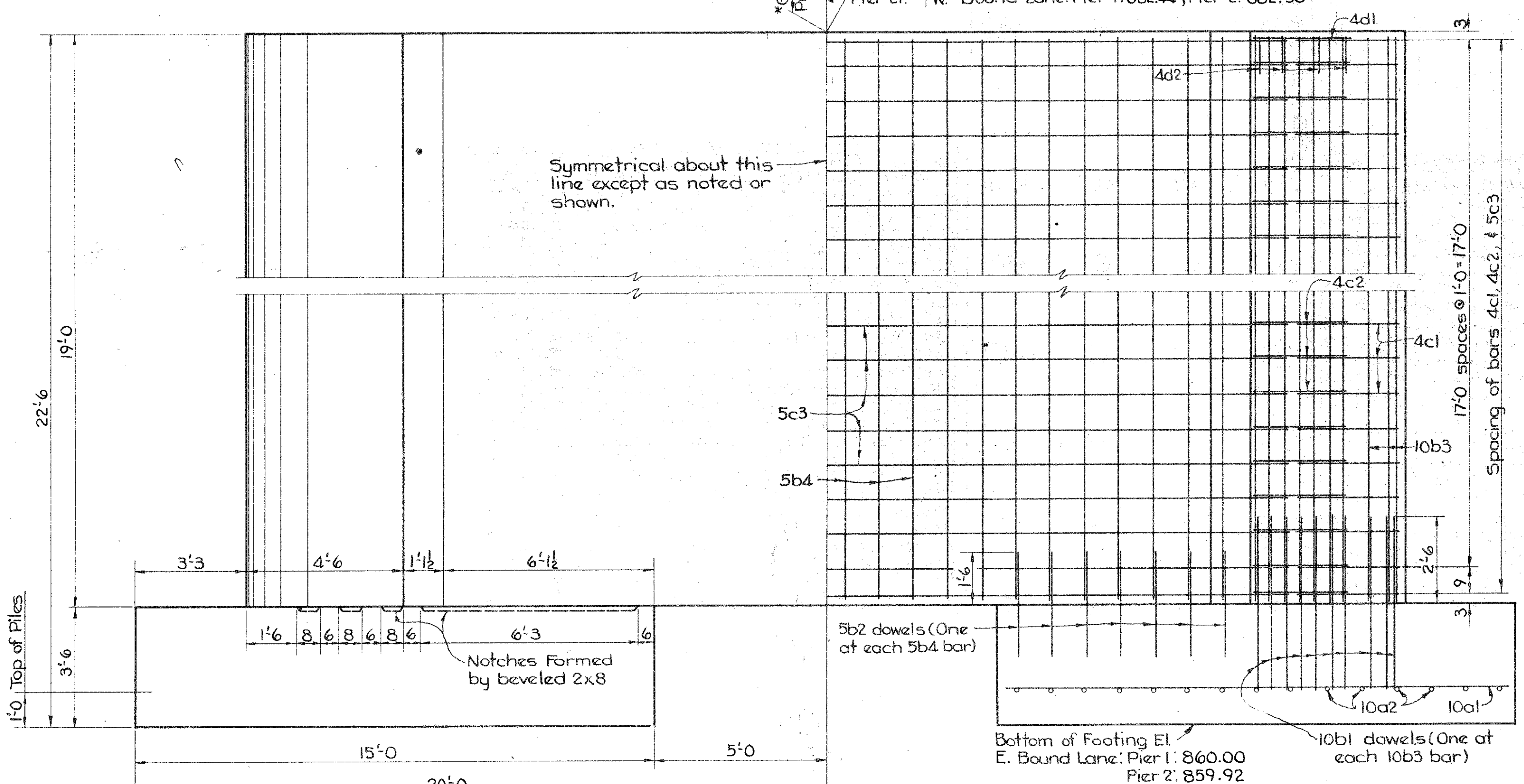
CONCRETE PLACEMENT QUANTITIES ~ ONE PIER		
Footings	2 @ 18.7	37.4
Column		43.6
	Total	81.0 c.y.

ESTIMATED QUANTITIES ~ FOUR PIERS	
Item	Quantity
Concrete	324.0 c.y.
Reinforcing Steel	39,768 lbs.
Untreated Wood Piling (Oak or Gumwood) 192 @ 35'	6720 l.f.
Class 20 Excavation	140 c.y.
Class 21 Excavation	520 c.y.

*Grade to Pier Top (Includes 1/16" for paint & canvas)
E. Bound Lane - Pier 1: 9'-3¼ ; Pier 2: 9'-3¼
W. Bound Lane - Pier 1: 9'-3¼ ; Pier 2: 9'-3⅜

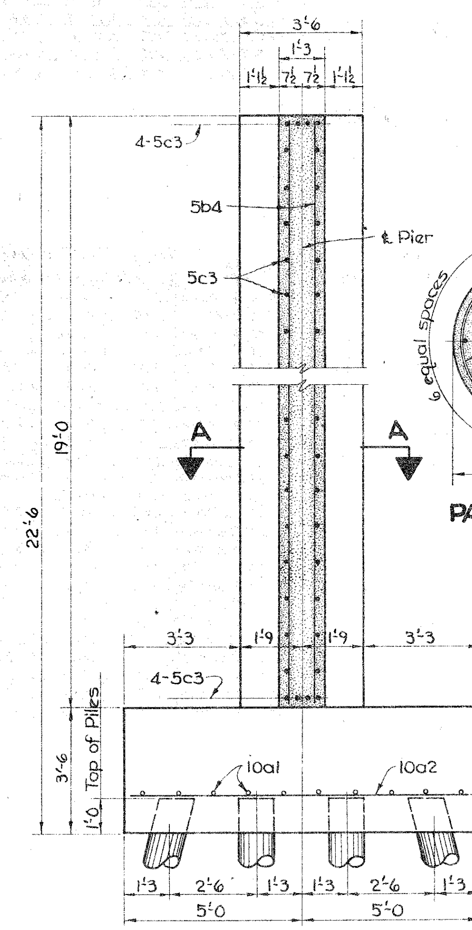
℄ Grade El. @ ℄ Pier | E. Bound Lane: Pier 1: 891.77 ; Pier 2: 891.69 | W. Bound Lane: Pier 1: 891.71 ; Pier 2: 891.76

Top of Pier El. | E. Bound Lane: Pier 1: 882.50 ; Pier 2: 882.42 | W. Bound Lane: Pier 1: 882.44 ; Pier 2: 882.50

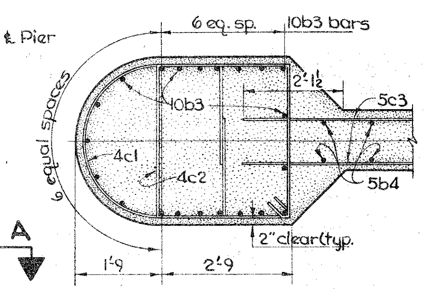


Bottom of Footing El.
E. Bound Lane: Pier 1: 860.00
Pier 2: 859.92
W. Bound Lane: Pier 1: 859.94
Pier 2: 860.00

ELEVATION
(Piles not shown)



℄ SECTION



PART SECTION A-A

PIER NOTES:

All exposed corners of 90° or sharper ~~are to be~~ were filleted with a ¾" dressed and beveled strip.

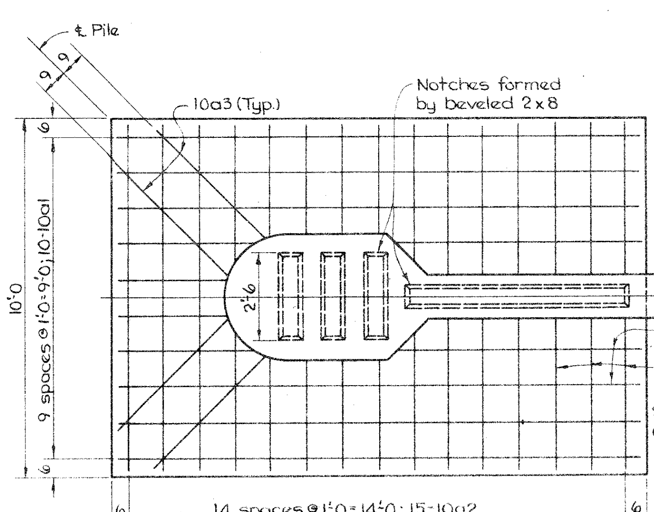
Reinforcing steel ~~shall be~~ was securely wired in place before concrete ~~is~~ was placed.

Minimum clear distance from face of concrete to near reinforcing bar is ~~to be~~ 2" unless otherwise noted or shown.

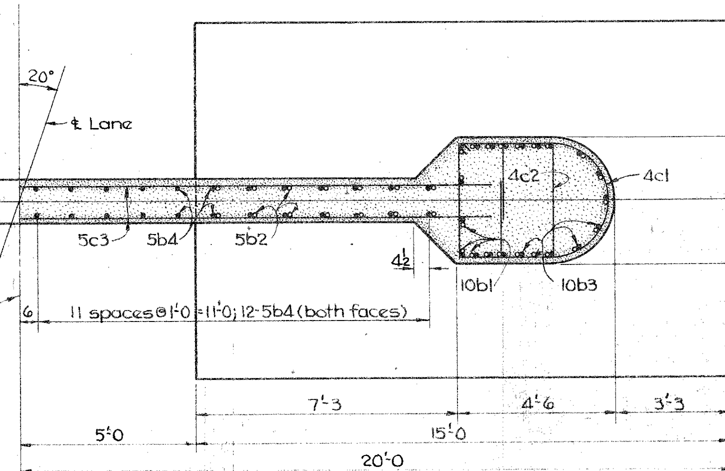
Anchor bolts ~~shall be~~ were set during placing of concrete in accordance with Section 2405.09 of the Standard Specifications. Weight of anchor bolts ~~is~~ was included in superstructure "Structural Steel" estimate.

Piling ~~shall be~~ was 35' untreated oak or gum wood. Required piling length ~~is~~ was determined by desired penetration of piling. Piling ~~shall be~~ was driven ~~and jetted~~ as close as practicable to desired penetration, but to at least 20 tons bearing value.

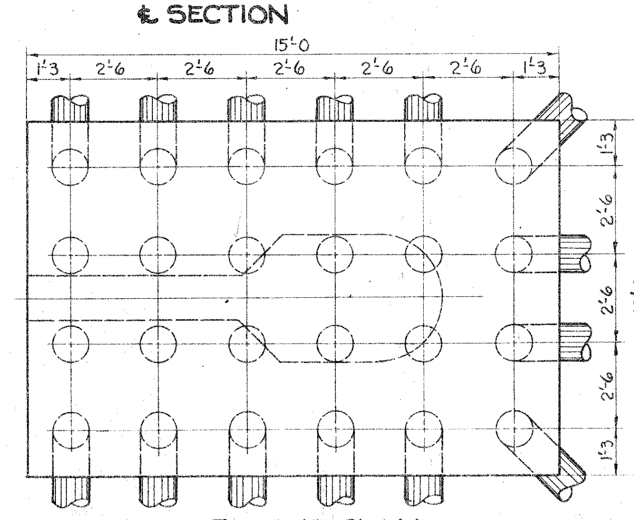
A test-load pile ~~shall be~~ was driven at Pier 1, East Bound Lane. See General Plan, sheet 2, for details.



HALF PLAN
Showing Footing Reinforcing Layout



HALF SECTION



FOOTING PLAN
Showing Piling Layout
(Typical for all footings)

Note: Battered piles ~~shall be~~ were battered 1:4 in direction indicated. Pile spacing is at bottom of footing.
48 - 35' Untreated Wood Piles ~~are~~ were required for each pier.

Design for 20° Skew
DUAL 320'-0 x 30' CONTINUOUS WELDED GIRDER BRIDGES AND WELDED WIRE RETARD

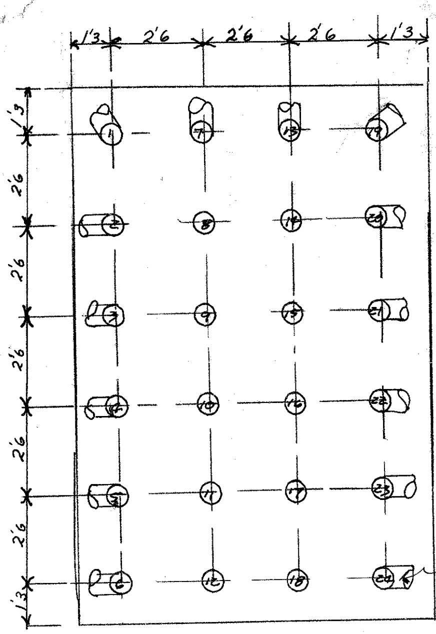
97'-6 End Spans | 125'-0 Interior Span
Concrete Floor & Substructure | Tubular Handrail

PIER DETAILS

Station: 1301 + 20.00 | Project № FU-1065(10)

STORY COUNTY
Iowa State Highway Commission

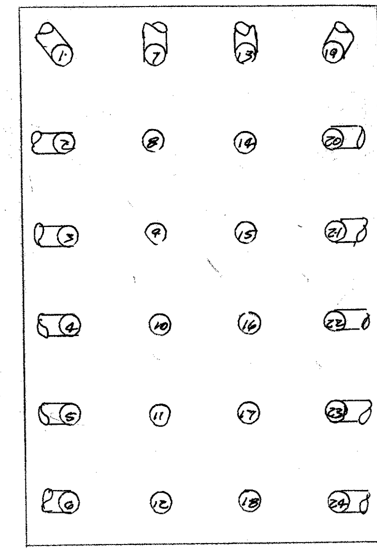
December 1962 | Sheet 7 of 15
Design № 3061 | Story County | File № 21503



Battered 1:4

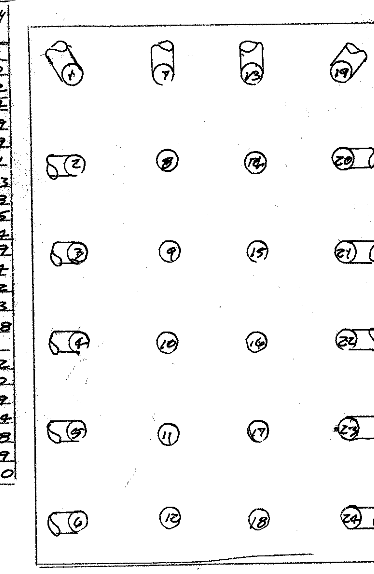
Pier No 1 West Bound Lane

Pile No.	Date Driven	Length in leads nearest ft.	Length cut off nearest .1 ft	Length in Structure	Ave. Pen. last 5 blows (inches)	Drop in feet	Bearing in tons
B1	8-14-63	35	1.0	34.0	1.35	8	22.9
B2	8-15-63	35	2.1	32.9	0.80	8	33.9
B3	8-14-63	35	2.2	32.8	1.30	8	23.5
B4	8-16-63	35	1.4	33.6	1.30	8	23.5
B5	8-15-63	35	1.1	33.9	1.05	8	27.8
B6	8-16-63	35	0.9	34.1	1.00	8	28.8
B7	8-16-63	35	1.8	33.2	1.05	8	27.8
8	8-16-63	35	1.1	33.9	0.95	8	31.7
9	8-16-63	35	1.7	33.3	1.10	8	28.4
10	8-16-63	35	1.4	33.6	0.75	8	37.4
11	8-16-63	35	1.7	33.3	0.80	8	35.8
12	8-16-63	35	2.3	32.7	0.85	8	34.3
B13	8-16-63	35	1.0	34.0	0.85	8	32.4
14	8-16-63	35	1.3	33.7	0.75	8	37.4
15	8-16-63	35	1.4	33.6	0.70	8	39.2
16	8-16-63	35	1.2	33.8	1.10	8	28.0
17	8-16-63	35	1.6	33.4	0.80	8	35.8
18	8-16-63	35	1.2	33.8	0.85	8	34.3
B19	8-14-63	35	1.7	33.3	1.10	8	26.9
B20	8-15-63	35	2.3	32.7	0.95	8	30.0
B21	8-14-63	35	1.5	33.5	1.00	8	28.8
B22	8-15-63	35	1.9	33.1	0.90	8	31.2
B23	8-14-63	35	1.3	33.7	1.05	8	27.8
B24	8-15-63	35	2.1	32.9	0.55	8	43.3



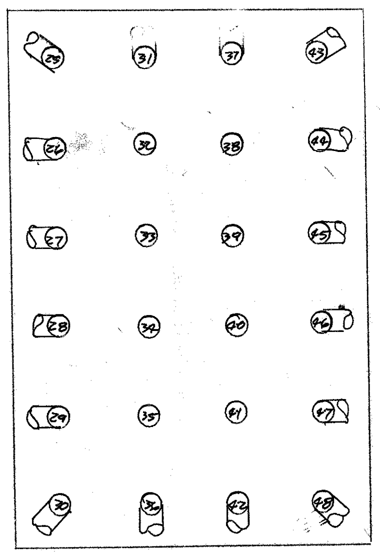
Pier No 2 West Bound Lane

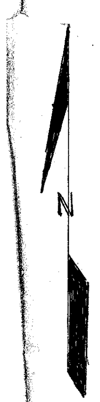
Pile No	Date Driven	Length in leads nearest ft.	Length cut off nearest .1 ft	Length in Structure	Ave. Pen last 5 blows (inches)	Drop in feet	Bearing in tons
B1	9-6-63	35	0.8	34.2	0.675	8	40.0
B2	9-6-63	35	1.2	33.8	0.60	8	41.0
B3	9-9-63	35	0.7	34.3	0.90	8	31.2
B4	9-9-63	35	0.7	34.3	0.85	8	32.4
B5	9-9-63	35	1.0	34.0	0.50	8	45.9
B6	9-9-63	35	0.9	34.1	0.40	8	51.9
B7	9-6-63	35	0.7	34.3	0.825	8	33.1
8	9-6-63	35	0.8	34.2	0.625	8	42.3
9	9-9-63	35	0.9	34.1	0.80	8	35.8
10	9-9-63	35	0.9	34.1	1.00	8	30.5
11	9-9-63	35	0.8	34.2	1.05	8	29.4
12	9-10-63	35	0.7	34.3	1.30	8	24.9
B13	9-6-63	35	0.9	34.1	0.975	8	29.4
14	9-9-63	35	0.9	34.1	0.70	8	39.2
15	9-9-63	35	1.0	34.0	0.85	8	34.3
16	9-9-63	35	0.9	34.1	0.80	8	35.8
17	9-9-63	35	4.7	30.3	B	8	—
18	9-10-63	35	0.6	34.4	0.70	8	39.2
B19	9-6-63	35	1.3	33.7	0.675	8	38.0
B20	9-9-63	35	0.9	34.1	0.80	8	33.9
B21	9-9-63	35	0.9	34.1	0.85	8	32.4
B22	9-9-63	35	0.5	34.5	1.00	8	28.8
B23	9-9-63	35	1.4	33.6	0.80	8	33.9
B24	9-10-63	35	1.0	34.0	0.60	8	41.0



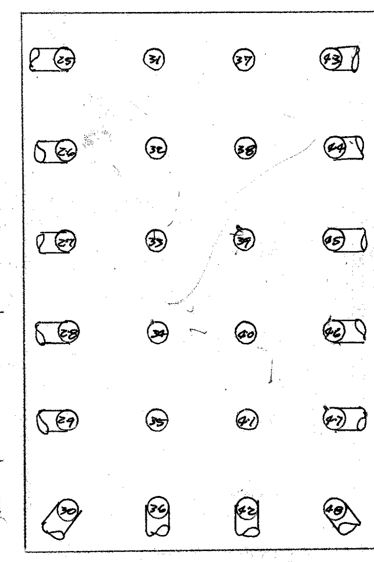
Pier No 1 East Bound Lane

Pile No.	Date Driven	Length in leads nearest ft.	Length cut off nearest .1 ft	Length in Structure	Ave. Pen last 5 blows (inches)	Drop in feet	Bearing in tons
B1	8-12-63	35	1.7	33.3	1.075	8	27.3
B2	8-12-63	35	2.2	32.8	0.975	8	29.4
B3	8-12-63	35	0.9	34.1	0.90	8	31.2
B4	8-12-63	35	1.0	34.0	0.85	8	32.4
B5	8-12-63	35	1.1	33.9	1.10	8	26.9
B6	8-13-63	35	1.2	33.8	0.60	8	41.0
B7	8-13-63	35	1.4	33.6	1.35	8	22.9
8	8-13-63	35	2.0	33.0	0.80	8	35.8
9	8-13-63	35	1.0	34.0	0.675	8	40.2
10	8-13-63	35	1.6	33.4	1.05	8	29.4
11	8-13-63	35	0.8	34.2	1.025	8	29.9
12	8-13-63	35	1.7	33.3	1.05	8	29.4
B13	8-13-63	35	1.5	33.5	1.10	8	26.9
A14	8-13-63	36	2.8	32.2	0.70	8	39.2
15	8-13-63	35	1.2	33.8	0.95	8	31.7
T16	8-13-63	35	23.1	11.9	1.45	8	22.9
17	8-13-63	35	1.0	34.0	0.90	8	33.0
A18	8-13-63	35	2.8	32.2	0.80	8	35.8
B19	8-12-63	35	1.1	33.9	1.10	8	26.9
B20	8-12-63	35	1.4	33.6	0.875	8	31.6
B21	8-12-63	35	0.9	34.1	0.875	8	31.6
B22	8-12-63	35	1.8	33.2	0.85	8	32.4
B23	8-12-63	35	0.7	34.3	1.075	8	27.3
B24	8-12-63	35	1.6	33.4	0.70	8	37.1

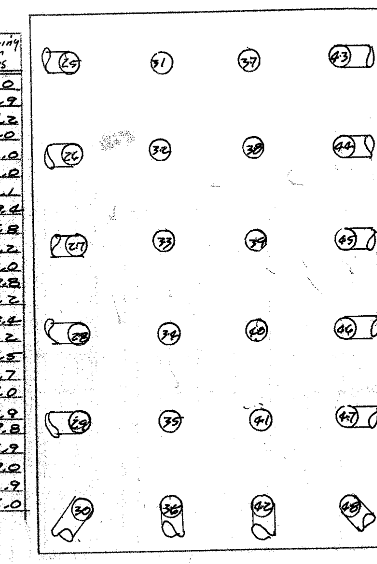




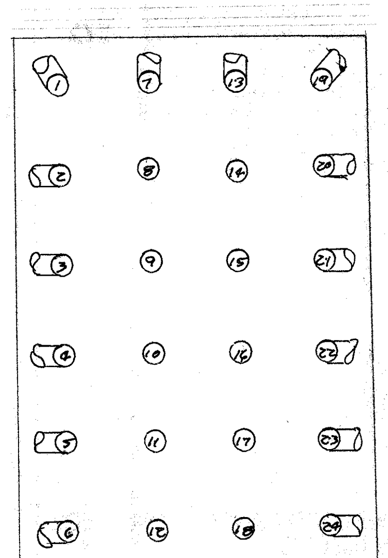
Pile no.	Date Driven	Length in leads nearest ft.	Length cut off nearest .1 ft	Length in Structure	Ave. pen. last 5 blows	Drop in feet	Bearing in tons
B25	8-19-63	35	1.0	34.0	0.80	8	33.9
B26	8-19-63	35	0.1	34.9	0.875	8	31.6
B27	8-19-63	35	1.6	33.4	0.85	8	32.4
B28	8-19-63	35	0.3	34.7	1.10	8	26.9
B29	8-19-63	35	1.4	33.6	1.25	8	22.9
B30	8-19-63	35	0.4	34.6	0.85	8	32.4
B31	8-19-63	35	1.4	33.6	1.20	8	26.6
32	8-19-63	35	1.6	33.4	0.80	8	35.8
33	8-20-63	35	1.5	33.5	1.20	8	26.6
34	8-20-63	35	1.8	33.2	0.85	8	34.3
35	8-20-63	35	1.7	33.3	1.10	8	28.4
36	8-19-63	35	1.8	33.2	1.25	8	23.0
37	8-19-63	35	1.9	33.1	0.75	8	37.4
38	8-19-63	35	1.7	33.3	1.10	8	28.4
39	8-20-63	35	1.6	33.4	0.95	8	31.7
40	8-20-63	35	2.1	32.9	0.425	8	53.2
41	8-20-63	35	1.4	33.6	0.95	8	31.7
B42	8-19-63	35	1.4	33.6	0.95	8	30.0
B43	8-19-63	35	1.7	33.3	1.10	8	26.5
B44	8-19-63	35	1.0	34.0	1.80	8	22.2
B45	8-19-63	35	1.4	33.6	0.90	8	31.2
B46	8-19-63	35	0.6	34.4	1.05	8	27.8
B47	8-19-63	35	1.0	34.0	0.95	8	30.0
B48	8-19-63	35	0.3	34.7	1.20	8	25.2



Pile No.	Date Driven	Length in leads nearest ft.	Length cut off nearest .1 ft	Length in Structure	Ave. pen. last 5 blows (inches)	Drop in feet	Bearing in tons
B25	9-10-63	35	0.6	34.4	0.60	8	41.0
B26	9-10-63	35	0.6	34.4	0.50	8	45.9
B27	9-10-63	35	1.1	33.9	0.90	8	31.2
B28	9-10-63	35	1.0	34.0	0.95	8	30.0
B29	9-10-63	35	0.6	34.4	1.15	8	26.0
B30	9-10-63	35	1.3	33.7	1.15	8	26.0
B31	9-10-63	35	0.4	34.6	0.70	8	37.1
32	9-10-63	35	0.7	34.3	1.10	8	28.4
33	9-10-63	35	1.0	34.0	0.80	8	35.8
34	9-10-63	35	0.8	34.2	0.70	8	39.2
35	9-10-63	35	0.7	34.3	0.90	8	33.0
B36	9-11-63	35	0.4	34.6	1.00	8	28.8
37	9-10-63	35	0.7	34.3	0.65	8	41.2
38	9-10-63	35	0.6	34.4	0.60	8	43.4
39	9-10-63	35	0.8	34.2	0.65	8	41.2
40	9-10-63	35	0.7	34.3	1.00	8	30.5
41	9-10-63	35	1.0	34.0	0.95	8	31.7
B42	9-11-63	35	1.0	34.0	0.60	8	41.0
B43	9-10-63	35	0.7	34.3	0.80	8	33.9
B44	9-10-63	35	1.1	33.9	1.00	8	28.8
B45	9-10-63	35	1.0	34.0	1.10	8	26.9
B46	9-10-63	35	0.8	34.2	0.65	8	39.0
B47	9-10-63	35	0.7	34.3	1.10	8	26.9
B48	9-11-63	35	1.0	34.0	1.15	8	26.0

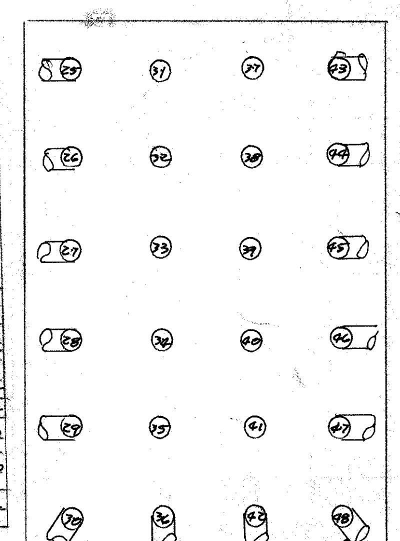


Pile no.	Date Driven	Length in leads nearest ft.	Length cut off nearest .1 ft	Length in Structure	Ave. Pen last 5 blows (inches)	Drop in feet	Bearing in tons
B25	8-9-63	35	1.5	33.5	0.85	8	32.4
B26	8-9-63	35	1.5	33.5	0.675	8	38.0
B27	8-9-63	35	1.2	33.8	1.10	8	26.9
B28	8-9-63	35	1.3	33.7	1.15	8	26.0
B29	8-8-63	35	1.4	33.6	1.45	8	26.6
B30	8-10-63	35	1.5	33.5	1.60	8	20.0
B31	8-10-63	35	1.1	33.9	1.25	8	25.7
32	8-9-63	35	1.1	33.9	1.35	8	24.3
33	8-9-63	35	1.1	33.9	1.25	8	25.3
34	8-9-63	35	1.2	33.8	0.90	8	28.9
35	8-10-63	35	1.3	33.7	0.85	8	34.3
B36	8-10-63	35	1.2	33.8	1.20	8	25.2
37	8-9-63	35	1.0	34.0	0.95	8	30.0
38	8-10-63	36	2.0	33.0	1.00	8	30.5
39	8-10-63	35	2.1	32.9	0.85	8	34.3
40	8-10-63	35	1.4	33.6	1.125	8	27.0
41	8-10-63	35	2.3	32.7	0.875	8	33.8
B42	8-10-63	35	1.8	33.2	1.25	8	24.3
B43	8-9-63	35	0.7	34.3	1.225	8	24.7
B44	8-10-63	35	1.1	33.9	1.15	8	26.0
B45	8-9-63	35	0.6	34.4	1.10	8	26.9
B46	8-10-63	35	0.9	34.1	1.025	8	28.3
B47	8-9-63	35	0.9	34.1	1.225	8	24.7
B48	8-9-63	35	0.5	34.5	1.225	8	24.7



N.½ Pier No 2 East Bound Lane

Pile No.	Date Driven	Length in leads nearest ft.	Length cut off nearest .1 ft	Length in Structure	Ave. Pen. last 5 blows (inches)	Drop in feet	Bearing in tons
B1	9-6-63	35	0.8	34.2	1.20	8	25.2
B2	9-6-63	35	1.0	34.0	1.10	8	26.9
B3	9-6-63	35	1.1	33.9	0.85	8	32.4
B4	9-5-63	35	0.7	34.3	1.00	8	30.5
B5	9-5-63	35	1.3	33.7	0.90	8	31.2
B6	9-5-63	35	1.1	33.9	1.25	8	24.3
B7	9-6-63	35	0.9	34.1	1.10	8	26.9
8	9-6-63	35	0.8	34.2	0.85	8	34.3
9	9-6-63	35	0.8	34.2	0.85	8	34.3
10	9-5-63	35	0.8	34.2	1.00	8	30.5
11	9-5-63	35	0.7	34.3	1.50	8	21.1
12	9-5-63	35	0.6	34.4	1.10	8	26.9
B13	9-6-63	35	0.7	34.3	0.90	8	33.0
14	9-6-63	35	0.8	34.2	0.60	8	44.4
15	9-6-63	35	1.1	33.9	0.50	8	48.5
16	9-6-63	35	0.9	34.1	0.85	8	34.3
17	9-5-63	35	0.9	34.1	1.00	8	30.5
18	9-5-63	35	0.5	34.5	1.00	8	30.5
B19	9-6-63	35	0.9	34.1	1.25	8	26.0
B20	9-6-63	35	1.1	33.9	0.45	8	48.7
B21	9-6-63	35	0.7	34.3	0.65	8	39.0
B22	9-5-63	35	1.1	33.9	0.75	8	43.3
B23	9-5-63	35	0.3	34.7	0.90	8	31.2
B24	9-5-63	35	1.0	34.0	0.75	8	35.4



S½ Pier No 2 East Bound Lane

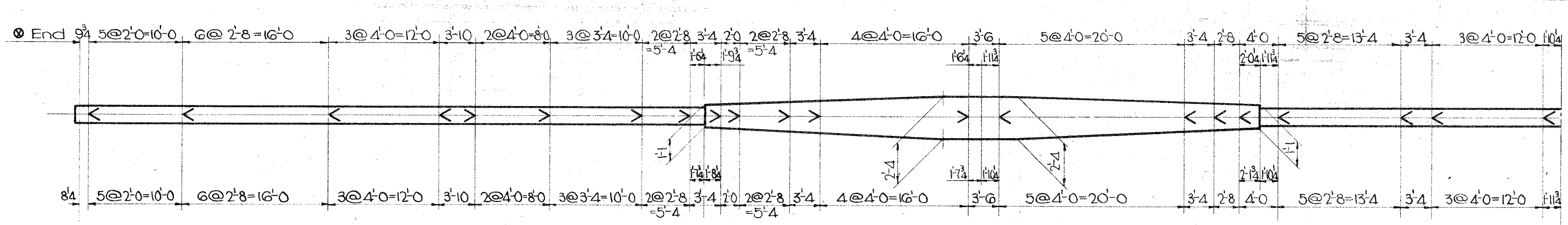
Pile no	Date Driven	Length in leads nearest ft.	Length cut off nearest .1 ft	Length in Structure	Ave. Pen last 5 blows (inches)	Drop in feet	Bearing in Tons
B25	9-5-63	35	1.4	33.6	1.10	8	26.9
B26	9-5-63	35	1.1	33.9	1.20	8	25.2
B27	9-5-63	35	1.1	33.9	0.90	8	31.2
B28	9-5-63	35	1.0	34.0	0.80	8	33.9
B29	9-5-63	35	1.0	34.0	0.90	8	31.2
B30	9-5-63	35	1.4	33.6	1.05	8	27.8
31	9-5-63	35	0.9	34.1	0.80	8	35.8
32	9-5-63	35	0.8	34.2	0.85	8	34.3
33	9-5-63	35	1.1	33.9	0.85	8	34.3
34	9-5-63	35	1.2	33.8	0.70	8	39.2
35	9-5-63	35	1.1	33.9	0.875	8	33.6
B36	9-5-63	35	1.4	33.6	1.05	8	27.8
37	9-4-63	35	0.8	34.2	1.00	8	30.5
38	9-4-63	35	0.5	34.5	1.35	8	27.5
39	9-4-63	35	0.9	34.1	1.30	8	24.9
40	9-4-63	35	1.1	33.9	0.85	8	34.3
41	9-4-63	35	1.0	34.0	1.10	8	28.4
B42	9-4-63	35	1.3	33.7	1.35	8	22.9
B43	9-4-63	35	1.2	33.8	1.00	8	28.8
B44	9-4-63	35	1.1	33.9	1.05	8	27.8
B45	9-4-63	35	2.4	32.6	1.10	8	26.9
B46	9-4-63	35	1.0	34.0	0.90	8	31.2
B47	9-4-63	35	1.4	33.6	0.85	8	32.4
B48	9-4-63	35	1.3	33.7	0.90	8	33.0

35 ft. Oak & Gum
Type of Hammer - Gravity
Gross Weight - 5090
Weight of pile - 1388
I.H.C. Hammer No. - 289
Effective Weight - 5080
I.H.C. cap No. - 168
Weight of cap - 1050
Formula used - $P = \frac{3WH}{S+0.35} \times \frac{W}{W+M}$ Vert.

$P = \frac{(3)(2.54)(8)}{S+0.35} \times \frac{5090}{7528}$

$P = \frac{60.96}{S+0.35} \times 0.676$

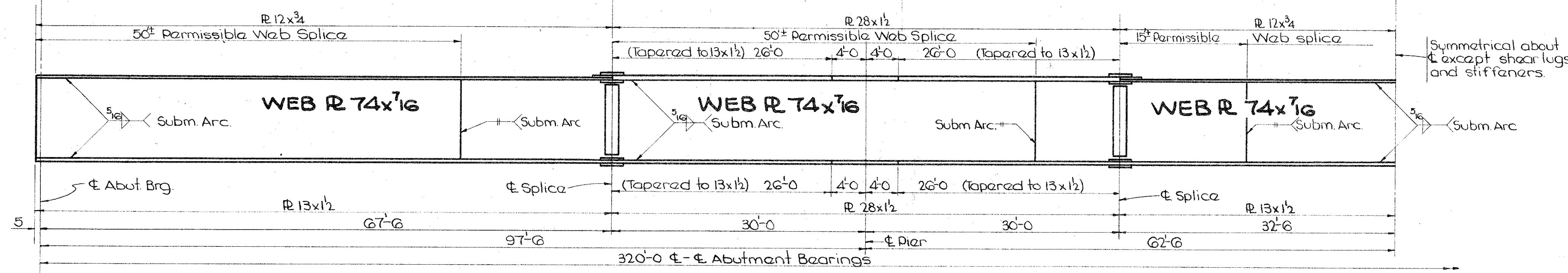
$P = \frac{41.21}{S+0.35}$



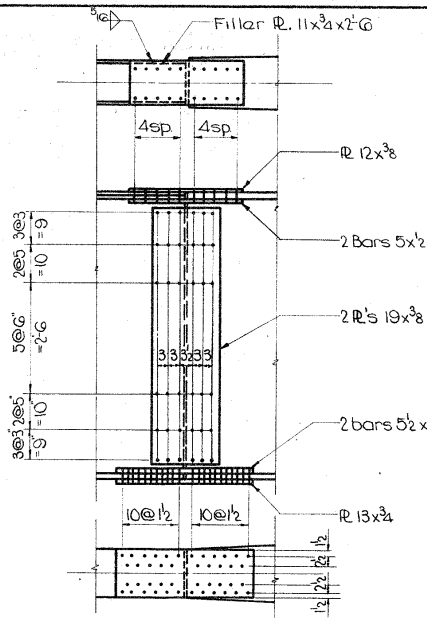
GIRDER SHEAR LUG SPACING

WELD NOTE:

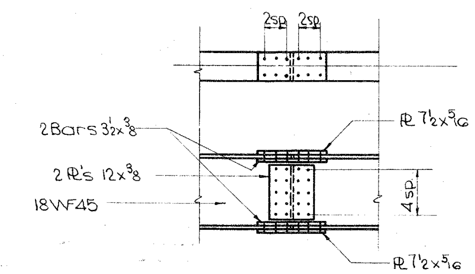
The design drawings indicate AWS prequalified welded joints and, unless otherwise noted, the design joint details are for manual shielded metal arc welding. Alternate joint details may be submitted for approval. Flange to web tee joints will not require full penetration of submerged arc fillet weld. Except as noted above, Article 2408.14 of the Iowa State Highway Commission Standard Specifications shall apply.



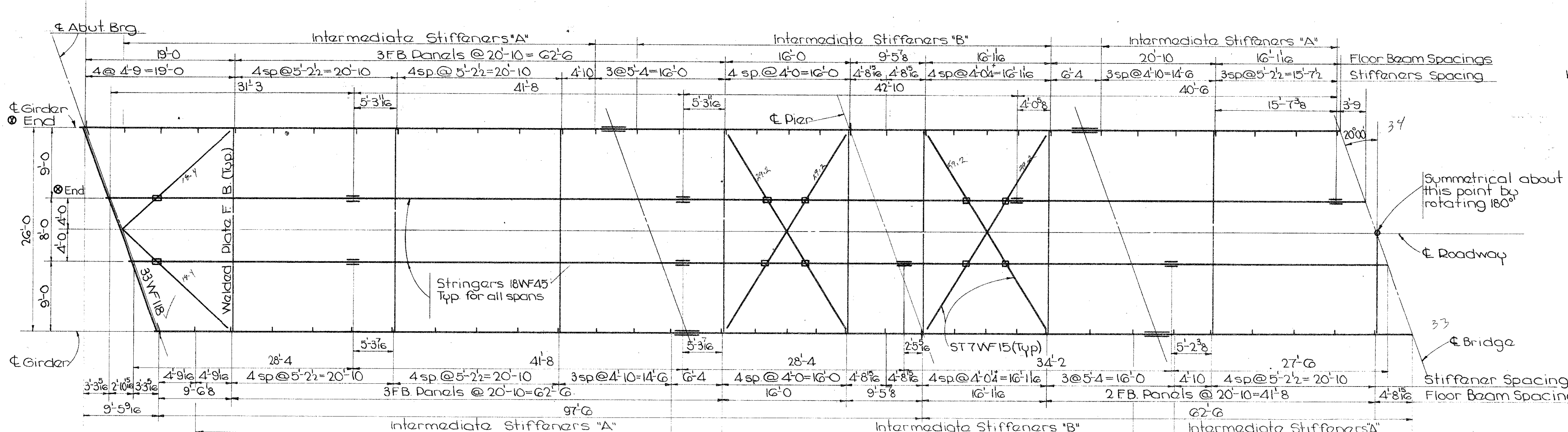
GIRDER DETAIL



GIRDER SPLICE DETAIL



STRINGER SPLICE DETAIL



Note: Connecting stiffeners on girder at each end of floor beam staggered as shown to facilitate the erection of floor beam.

□ Indicates cross bracing hangers. See hanger detail Sheet No. 9.

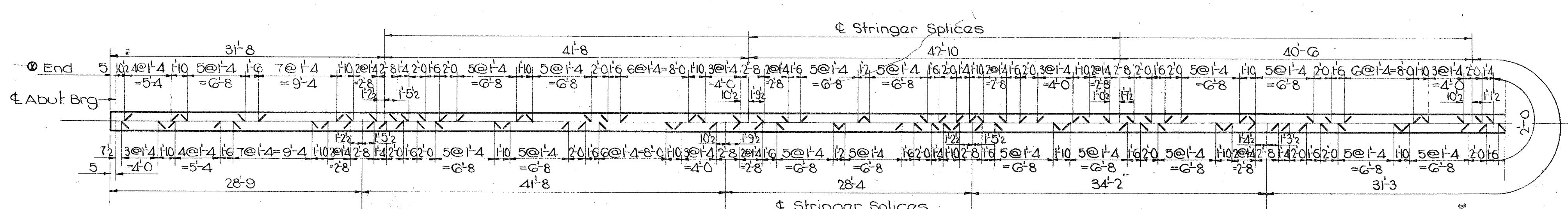
STRUCTURAL STEEL LAYOUT

Note: Positive Moments due to D.L. No. 2, Live Load and Impact are resisted by composite action of girder and slab. Shear lugs are used to insure composite action. D.L. No. 1 includes weight of slab, girders, stringers, floor beams and diaphragms. D.L. No. 2 includes weight of curbs, rail, and future wearing surfaces. Max. Neg. Mom. increase at Pier is 17.7%

MAXIMUM MOMENTS & REACTIONS

ITEM	LOAD (Kips/ft)	Max. Positive Mom's. End Span	Max. Positive Mom's. Cntr. Span	Max Neg. M At Pier	Max. Reactions Abut.	Max. Reactions Pier
D.L. No. 1	1.980	1085.0	910.0	2940.0	66.3	250.3
D.L. No. 2	0.697	445.0	480.0	879.0	25.0	86.5
C.L.L.*	2146/31.00	/	/	4292/	/	/31.0
U.L.L.	0.763			1083.8		100.4
H20-S16	38.15	1420.0	1491.0		75.8	
Imp.		318.0	298.0	320.0	17.0	27.8
TOTAL				5652.0	184.1	496.0

Note: Moments are in Foot-Kips and Reaction in Kips.
*Upper figure is for Moment, lower figure is for shear.



STRINGER SHEAR LUG SPACING

Design for 20° Skew

DUAL 320'-0 x 30' CONTINUOUS WELDED GIRDER BRIDGES AND WELDED WIRE RETARD

97'-6 End Spans; 125'-0 Interior Span
Concrete floor & substructure — Tubular handrail

SUPERSTRUCTURE DETAILS

Station: 1301+20.00 — Project No. FU-1065(10)

STORY COUNTY

Iowa State Highway Commission
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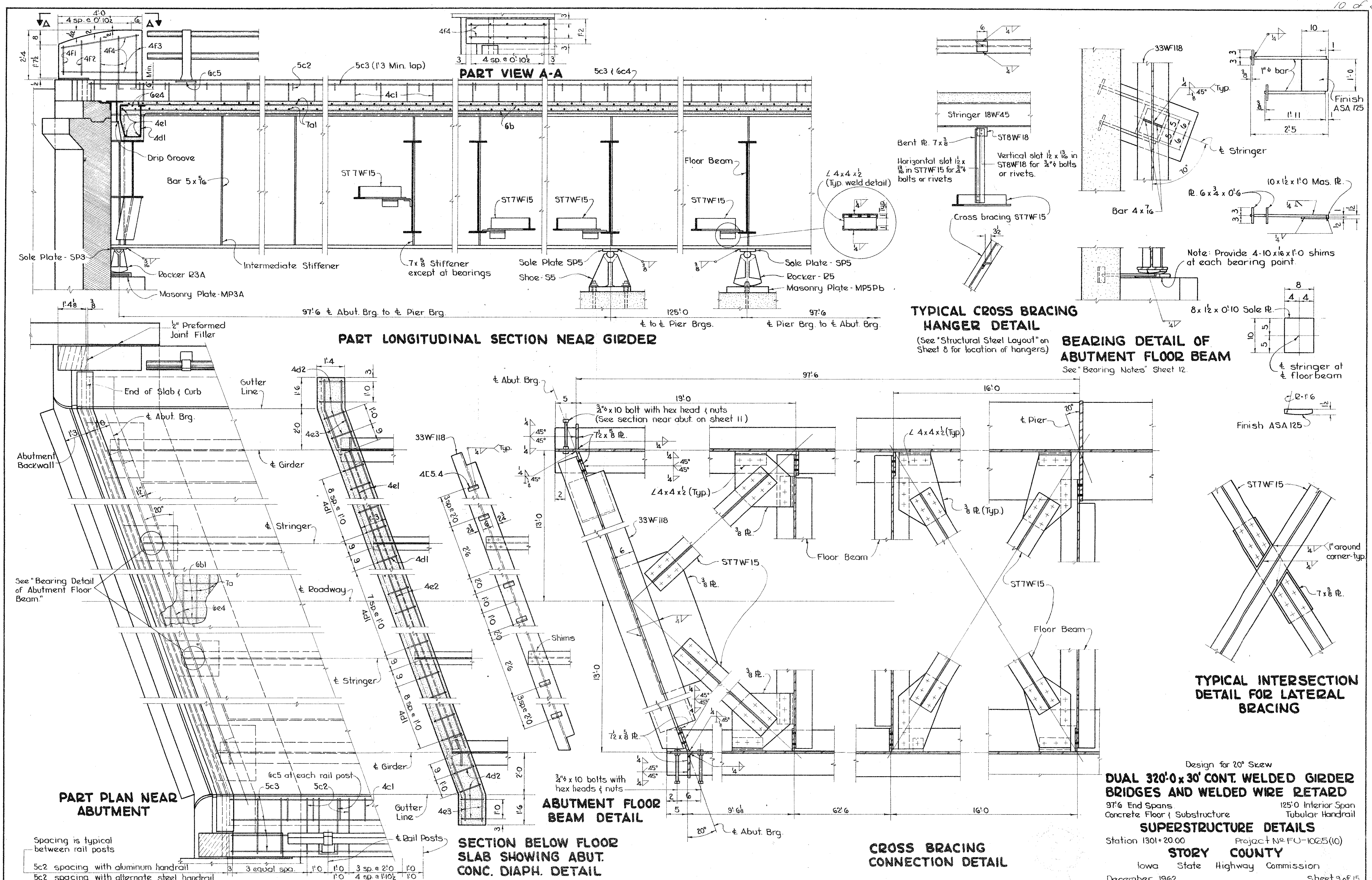
Design No. 3061 — Story Co. — File No. 21508

DIETZGEN NO. 121 ARKWRIGHT



Design for 20° Skew

DUAL 320'-0 x 30' CONT. WELDED GIRDER BRIDGES AND WELDED WIRE RETARD

97'-6 End Spans — 125'-0 Interior Span

Concrete Floor & Substructure — Tubular Handrail

SUPERSTRUCTURE DETAILS

Station 1301+20.00 — Project No FU-1065(10)

STORY COUNTY

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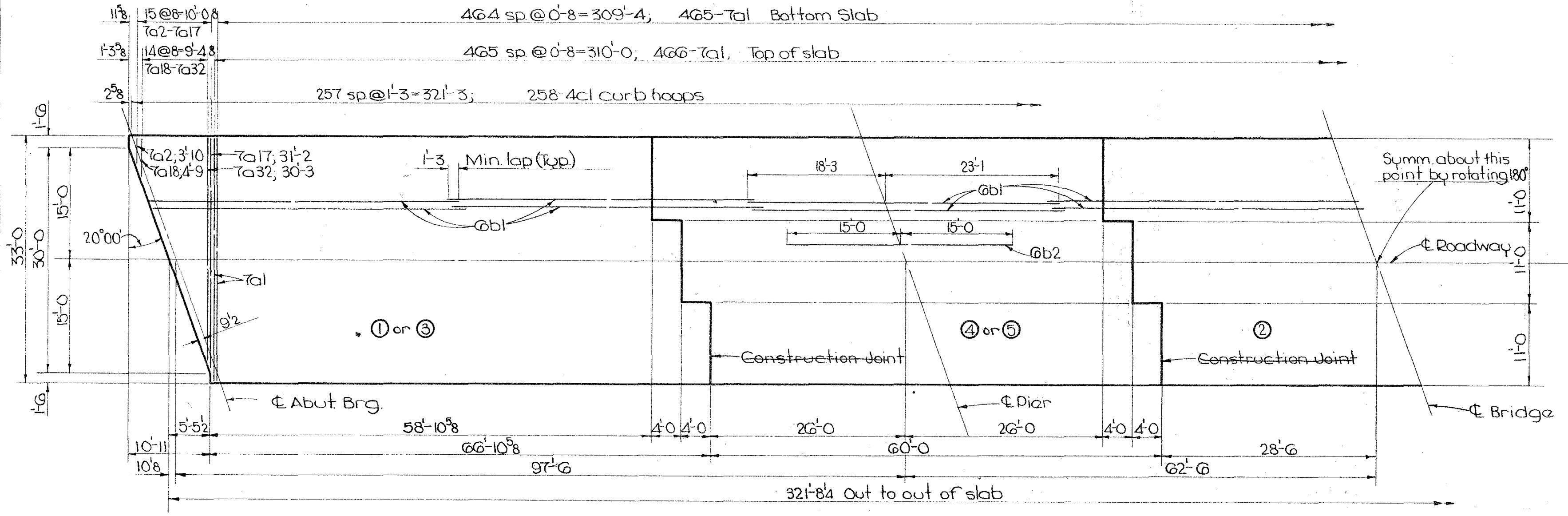
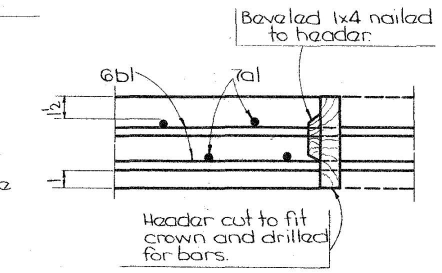
Design 3061 — Story County — File No 21508



REINFORCING PLAN & CONCRETE PLACEMENT DIAGRAM

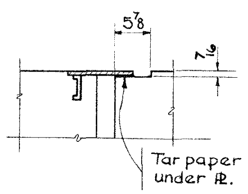
Note: Roadway slab ~~shall be placed in sections and in sequences as indicated in circled numbers and preferably at intervals not exceeding 24 hours~~ was placed continuously. Curbs ~~may be~~ placed continuously.
Alternate procedures for placing concrete ~~may be~~ submitted for approval together with a statement of the proposed method and evidence that the contractor possesses the necessary equipment and facilities to accomplish the required result.



SLAB CONSTRUCTION JOINT DETAIL

REINFORCING STEEL-ONE SUPERSTRUCTURE					
Bar	Location	Shape	№	Length	Weight
7a1	Slab, transverse, top & bottom	—	931	32'-8	62,164
7a2-17	" " , end, "	—	32	Varies	1,145
7a18-32	" " " , top	—	30	Varies	1,073
6b1	Slab, longitudinal, top & bottom	—	408	41'-4	25,330
6b2	" " , Over Piers	—	44	30'-0	1,983
4c1	Curb, hoops	⊔	516	4'-5	1,522
*5c2	Curb, transverse	⌐	~~308~~ ~~348~~ 346	2'-9	~~945~~ ~~941~~ 993
5c3	Curb, longitudinal	—	72	36'-10	2,766
6c4	" " , Over Piers	—	12	30'-0	541
*6c5	Rail Post Anchor	⊏	~~56~~ ~~80~~ 68	5'-6	~~463~~ ~~661~~ 562
4d1	Abutment Diaphragm Hoops	⊏	52	4'-8	162
4d2	" " End Hoops	⊔	16	3'-3	35
4e1	" " , longit.	—	12	9'-3	74
4e2	" " "	—	6	8'-1	32
4e3	" " " , End	⁄	16	3'-4	36
6e4	" " " , Top	—	4	31'-9	191
4f1	End Post, Vertical	—	8	1'-7	8
4f2	" " "	—	8	2'-0	11
4f3	" " "	⌐	24	3'-1	49
4f4	" " , Horizontal	—	16	3'-9	40
	Total				~~98,764lb~~ ~~98,6??~~ 98,717lb

*~~For Aluminum Rail. (See sheet 15 for steel rail.)~~

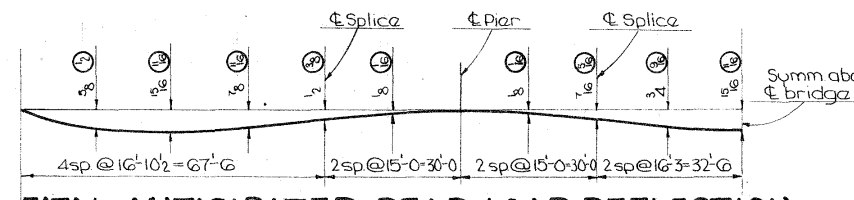


SECTION F-F

	E. Abut.	W. Abut.
Temp.	"D"	"D"
10°	3$\frac{1}{16}$	2$\frac{13}{16}$
50°	2½	2½
90°	1$\frac{15}{16}$	2$\frac{3}{16}$

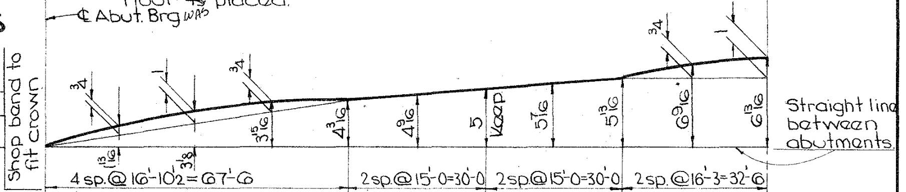
Note: Proportionate values ~~are to be~~ were used for other temperatures.

EXPANSION ℞ SETTINGS



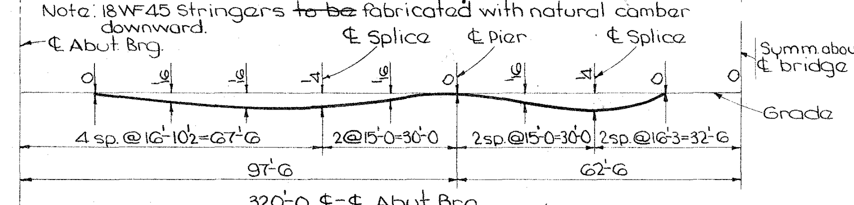
TOTAL ANTICIPATED DEAD LOAD DEFLECTION

Note: Encircled figures indicate deflection anticipated when concrete floor ~~is~~ was placed.



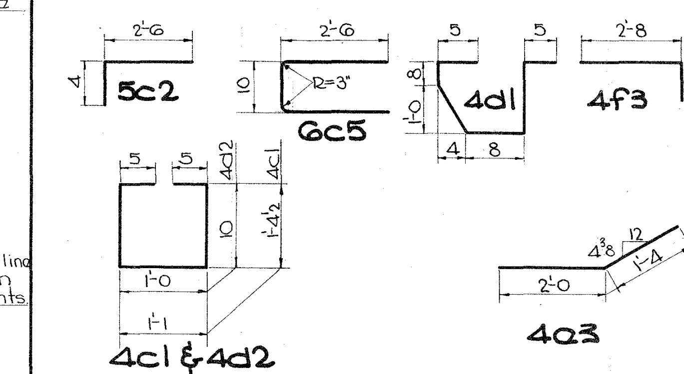
GIRDER AS FABRICATED & ERECTED

Note: 18WF45 Stringers ~~to be~~ fabricated with natural camber downward.



SLAB THICKENING DIAGRAM
(For Estimating Purposes Only)

BENT BAR DETAILS

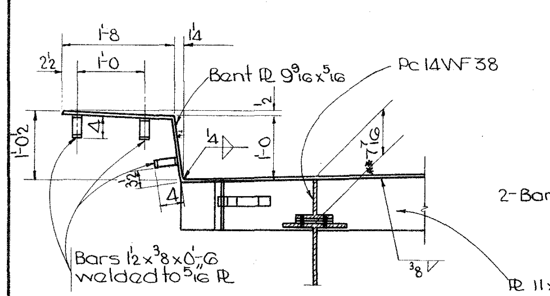


Note: Radii to ℄ bar. All dimensions are out to out.

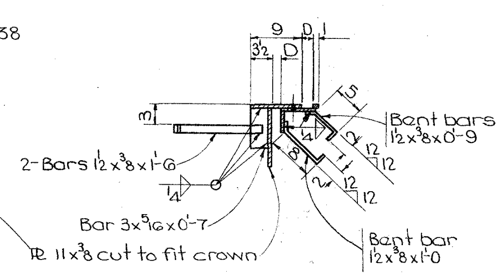
SUPERSTRUCTURE-CONC PLACEMENT QUANTITIES	
Location	Quant's.
Rdwy. Slab 2@54.0 ① or ③	108.0
②	49.8
2@45.9 ④ or ⑤	91.8
Curbs	64.1
End Posts	1.5
Total for one superstr.	315.2 cy.

ESTIMATED QUANT'S. TWO SUPERSTRUCTURES	
Item	Amount
Concrete	630.4 cy.
*Reinforcing Steel	~~197,528 lb.~~ 197,434 lb.
Structural Steel	~~519,468 lb.~~ 572,310

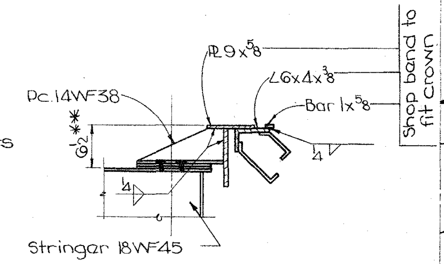
*~~For Aluminum Rail. (See sheet 15 for steel rail.)~~



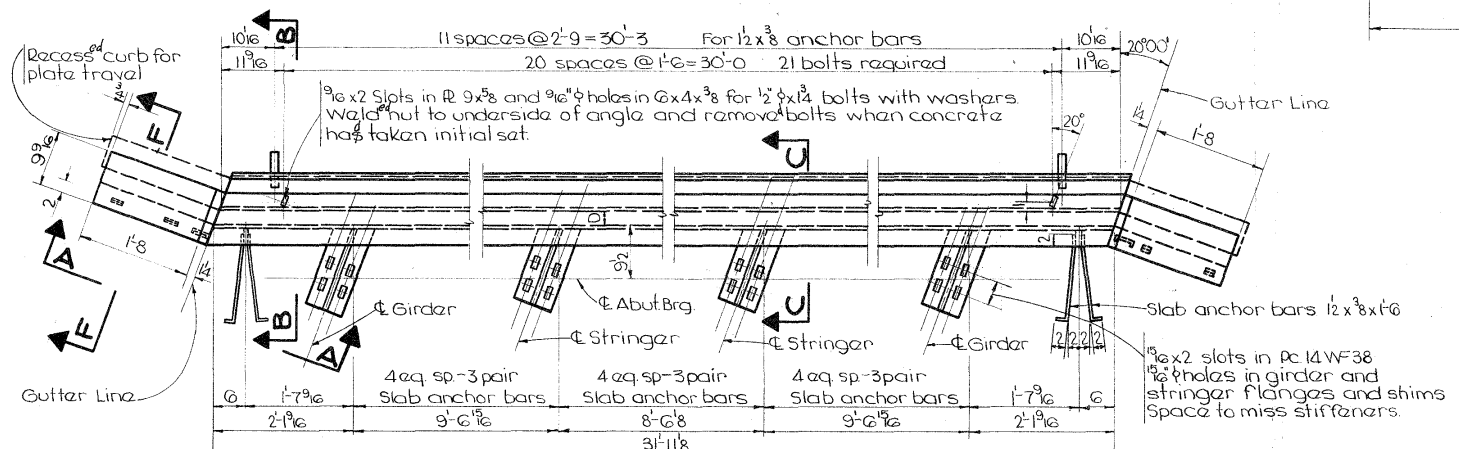
SECTION A-A



SECTION B-B



SECTION C-C



EXPANSION PLATE DETAILS
Two required for each bridge
Wt. = 1772 lbs each

ROCKER SETTINGS				
Temperature at time of setting	West Abut.	PIER № 1	PIER № 2	East Abut.
		Fixed		
10°	−5/16		−3/8	−11/16
50°	0		0	0
90°	+5/16		+3/8	+11/16

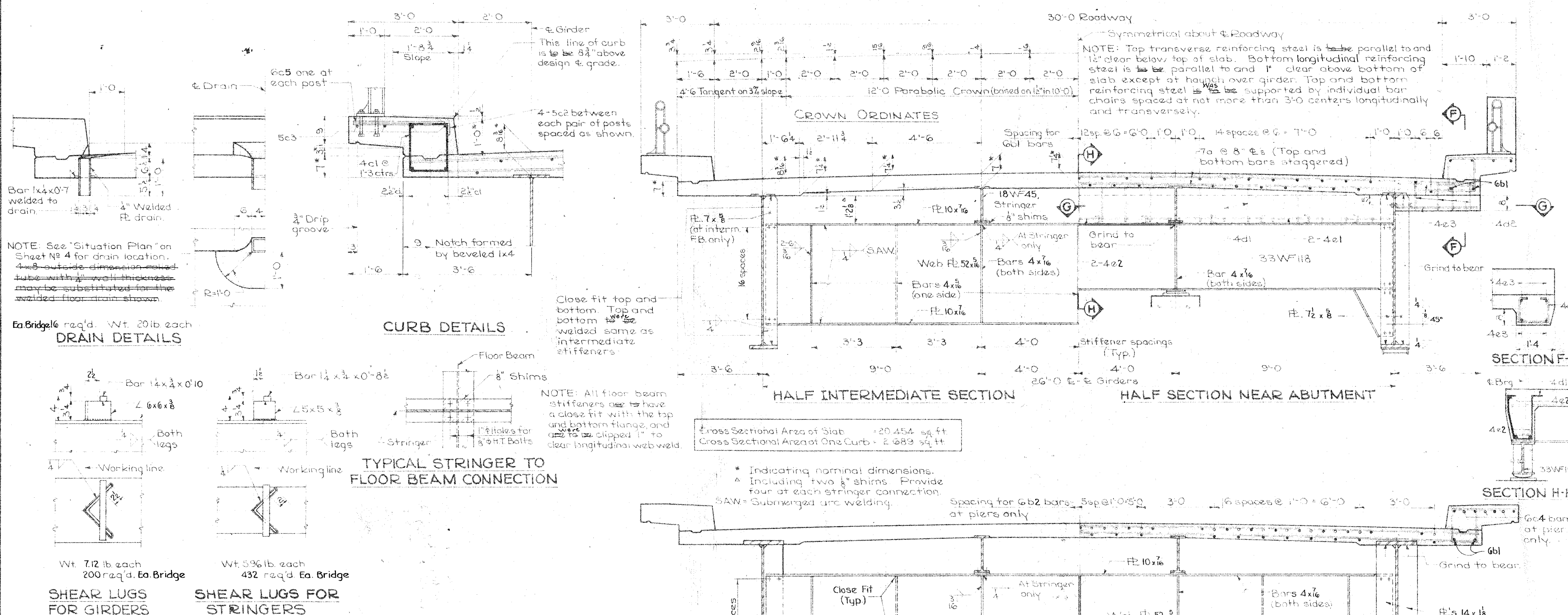
Rocker positions shown indicate + dimensions
Proportionate values ~~are to be~~ were used for other temperatures.

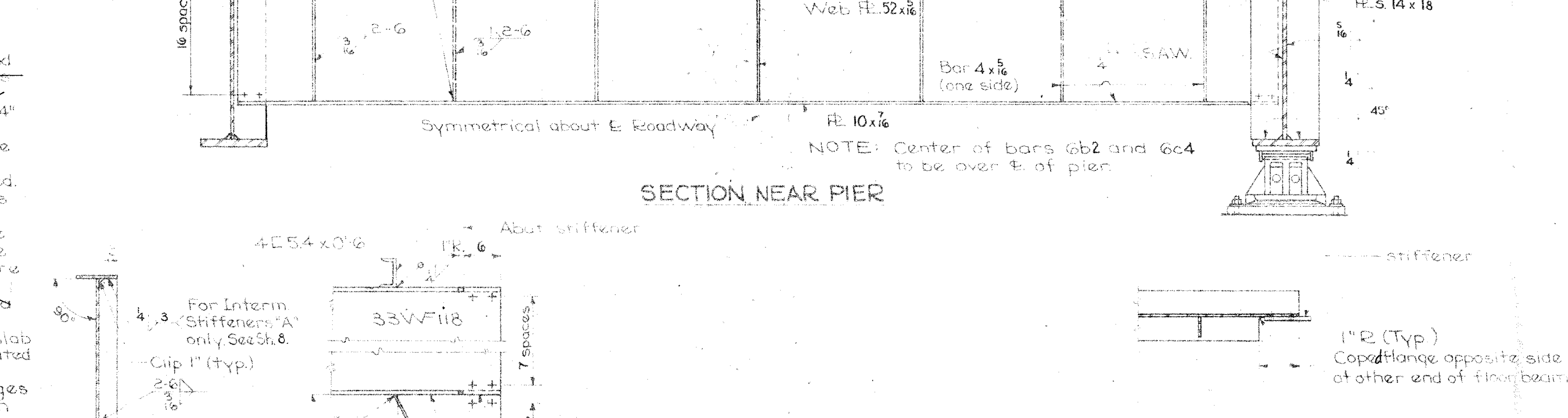
Revised 5-6-63: Structural Steel quantity corrected.

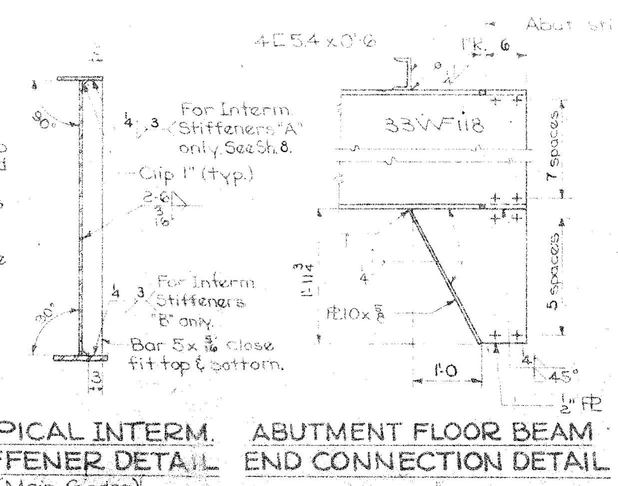
Design for 20° Skew
DUAL 320'-0x30' CONTINUOUS WELDED GIRDER BRIDGES
AND WELDED WIRE RETARD
97'-6 End Spans 125'-0 Interior Span
Concrete floor & substructure Tubular handrail
SUPERSTRUCTURE DETAILS
Station 1301+20.00 Project № FU-1065(10)
STORY COUNTY
Iowa State Highway Commission
December 1962 Sheet 10 of 15

Design № 3061 Story County File № 21508

Designed by: H.B.M. Traced by: B Checked by: H.D.E.







SUPERSTRUCTURE NOTES:

This bridge ~~is~~ was designed for H 20-S16 loading and alternate loading designated in the Bureau of Public Roads P.P.M. 20-4, Section C, plus 19 lb. per sq ft of roadway for future wearing surface.

The floor slab as shown includes ½" of wearing surface.

All field connections, except as noted, ~~are to be riveted or~~ bolted using high tensile strength bolts. The estimated weight and pay weight of structural steel ~~is~~ was based on riveted connections.

Unless otherwise noted, all bolts ~~or rivets~~ are ~~to be~~ ⅞"φ and all open holes are ~~to be~~ 15/16"φ.

The girder splices ~~are to be~~ were supported by ~~false work or~~ other approved means as directed by the Engineer, and adjusted as closely as possible to the dimensions shown on the diagram "Girder As Fabricated And Erected" before ~~riveting and~~ bolting ~~is~~ was completed.

The parts of structural steel inaccessible after erection ~~are to be~~ were given three coats of paint in the shop.

~~All structural steel to be A.S.T.M. A 36 Steel.~~

All flange plates, flange splice plates and web splice plates are ~~to be~~ U.M. plates except flange plates that are cut to taper.

The flange plates for all floor beams except the abutment ~~shall be~~ are coped near side on one end and far side on the other end.

Flange and web plates of main & floor beam girders, stringers, bearing stiffeners, and splice plates ~~shall~~ conformed to A.S.T.M. Specification for A 36 Carbon Steel. All other structural steel, except as noted, ~~shall~~ conformed to the A.S.T.M. Specifications for A 7, A 373, or A 36 Carbon Steel.

~~Approved stud shear connectors may be used as an alternate for the angle shear connectors shown. If studs are used, each angle lug 5x5x⅜ is to be replaced by a group of 8-⅞"φx4" studs, and each angle lug 6x6x⅜ is to be replaced by a group of 10-⅞"φx4" studs. The centroid of the stud group is to be in the approximate location of the angle lug replaced. Maximum spacing between ℄ of stud rows is to be 24" and where the angle lug spacing exceeds 24" the equivalent studs are to be located in two or more rows so that the maximum spacing is not exceeded. Studs are to be welded in the shop at the locations shown on shop drawings approved by the Iowa State Highway Commission.~~

Shear lugs are spaced in multiples of the slab transverse reinforcing bar spacing and are located so as to clear bottom transverse bars.

Paint ~~is to be~~ was omitted on tops of top flanges and all other steel surfaces in contact with concrete.

The forms for roadway slab and curbs ~~are to be~~ were supported by stringers, floor beams and girders.

SPECIFICATIONS:

DESIGN: A.A.S.H.O., Series of 1961.
CONSTRUCTION: Iowa State Highway Commission Standard Specifications, Series of 1960, plus current Special Provisions and Supplemental Specifications.

Revised 11-15-62 Slab reinforcing at pier changed & intermittent weld on girder stiffeners changed.

Revised 2-27-63; Superstructure Notes changed to designate use of different steels.

Design for 20° Skew

DUAL 320'-0 x 30' CONTINUOUS WELDED GIRDER BRIDGES AND WELDED WIRE RETARD

97'-6 End Spans | 125'-0 Interior Span
Concrete Floor & Substructure | Tubular Handrail

SUPERSTRUCTURE DETAILS

Station 1301 + 20.00 | Project № FU-1065(10)

STORY COUNTY

IOWA STATE HIGHWAY COMMISSION
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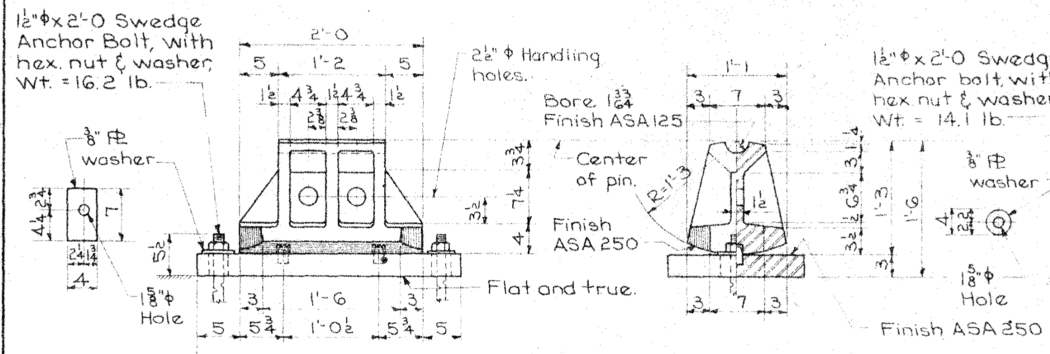
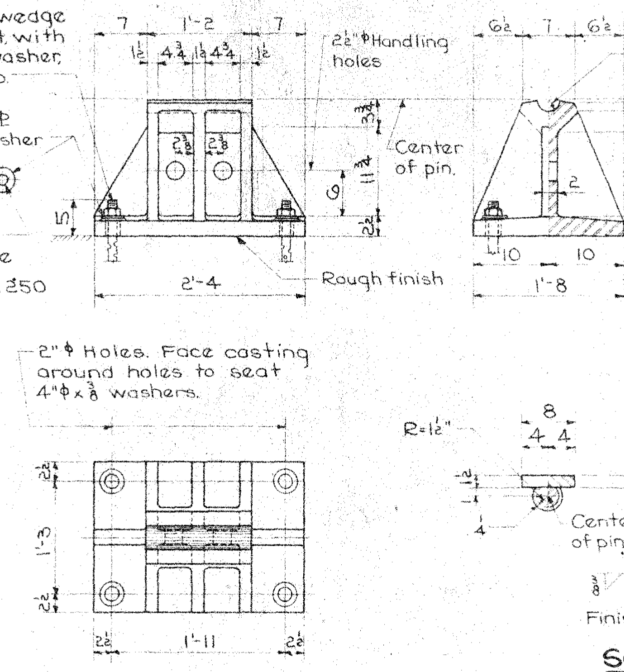
Design № 3061 | Story County | File № 21508

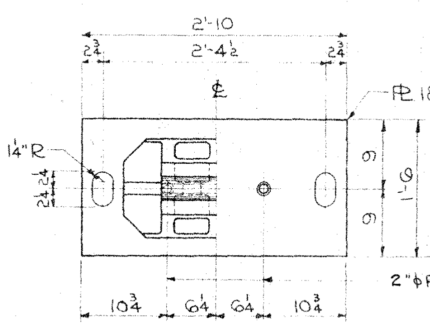
Checked by: H.B.M.



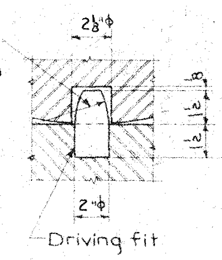
ROCKER R4
Wt. = 464 lb.



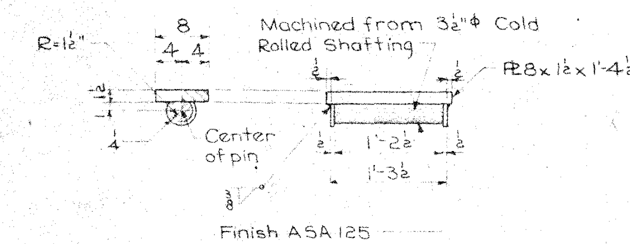
FIXED SHOE S4
Wt. = 735 lb.



PIER MASONRY PLATE MP4P
Wt. = 497 lb.



TYPICAL PINTLE DETAIL



SOLE PLATES SP4 FOR R4 & S4
Wt. = 85 lb.

BEARING NOTES:

Nodular Iron Castings ~~shall~~ comply[ed] with Article 4153.04 of the Standard Specifications and with ASTM A-339, Grade 60-45-10.

The following ~~shall be~~ [are] Nodular Iron Castings:

~~R4 MP4P S4~~
R5 MP5Pb S5

All plates and bars ~~shall~~ comply with ASTM A-36. Pins shall comply with Article 4153.02 of the Standard Specifications and with ASTM A-108.

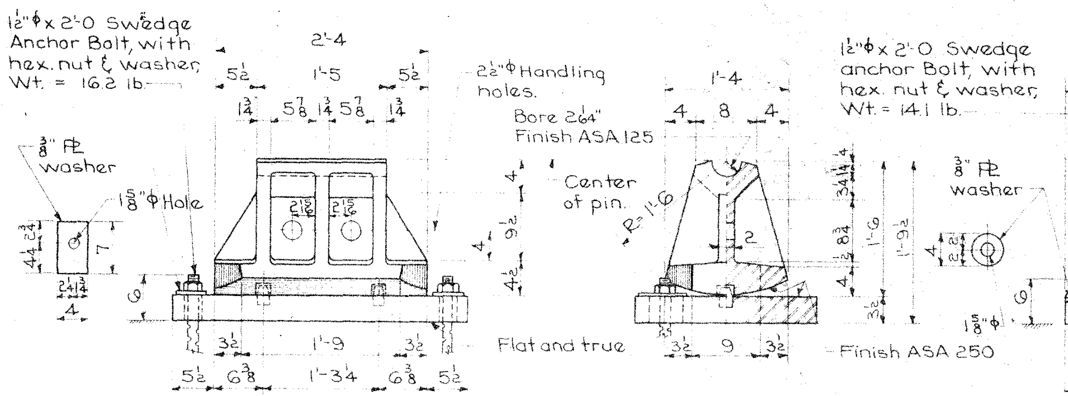
All bearings ~~are to be~~ [were] set in paint and canvas.

Anchor bolts ~~shall be~~ [were] set in accordance with Article 2408.46 of the Standard Specifications.

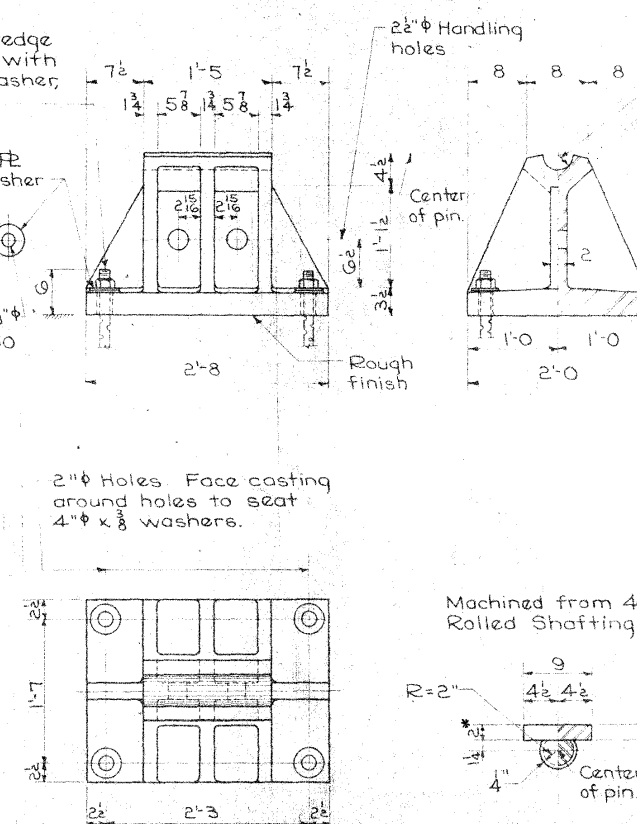
After masonry plates, rockers and shoes are in correct location, pour[ed] mortar around anchor bolts to fill slotted holes.

The weight of bearings shown does not include the weight of paint.

Surface finished with an ASA 125 Finish ~~shall be~~ [was] shop coated with an application of white lead and tallow as soon as the surfacing process ~~is~~ [was] done. The shop coated surfaces ~~are to be~~ [were] wiped clean and then a field coat of white lead and tallow ~~is to be~~ [was] applied just before the erection of structural steel in the field.



ROCKER R5
Wt. = 776 lb.



FIXED SHOE S5
Wt. = 1274 lb.

~~Note: Sole Plate is~~ [was] to be thickened by amounts shown and at locations shown in the following table.

Lane	Pier	Girder	Amount
W.B.	1	S.	5/16
E.B.	1	S.	1/4
W.B.	2	N.	1/4
E.B.	2	N.	5/16

DISTANCE FROM TOP OF SOLE PLATE TO BRIDGE SEAT

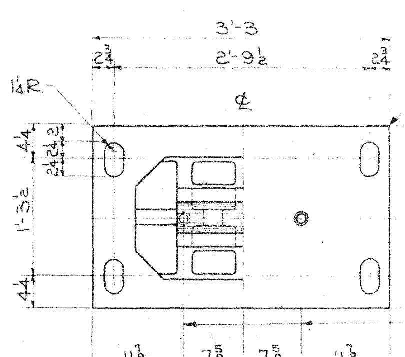
Rockers & Fixed Shoes	D*
R4 & S4	* 1'-8 9/16
R5 & S5	* 2'-0 13/16

* Including 1/16" paint and canvas. Varie[d] with changes in sole plate thickness, as shown in table at left.

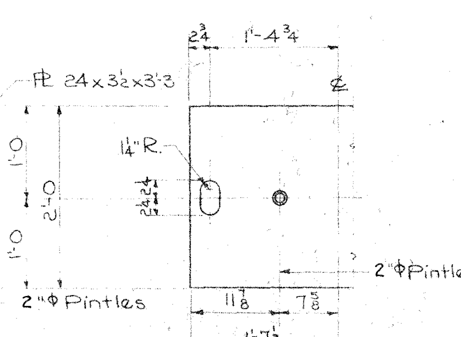
MAXIMUM REACTION (In Kips)

R4 S4	R5 S5
475	650

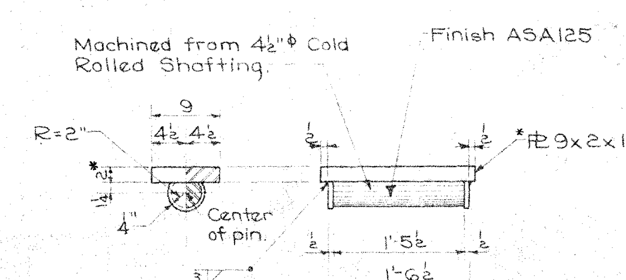
Note: Used SP5, S5, R5, and MP5Pb from this sheet for pier bearing material.



PIER MASONRY PL MP5Pa FOR SPAN LENGTH GREATER THAN 150'
Wt. = 877 lb.



PIER MASONRY PL MP5Pb FOR SPAN LENGTH 101' TO 150'
Wt. = 897 lb.



SOLE PLATES SP5 FOR R5 & S5
Wt. = 159 lb.

Design for 20° Skew

DUAL 320'-0 x 30' CONTINUOUS WELDED GIRDER BRIDGES AND WELDED WIRE RETARD

97'-6 End Spans — 125'-0 Interior Span
Concrete Floor & Substructure — Tubular Handrail

BEARING DETAILS

Station 1301+20.00 — Project No FU-1065(10)

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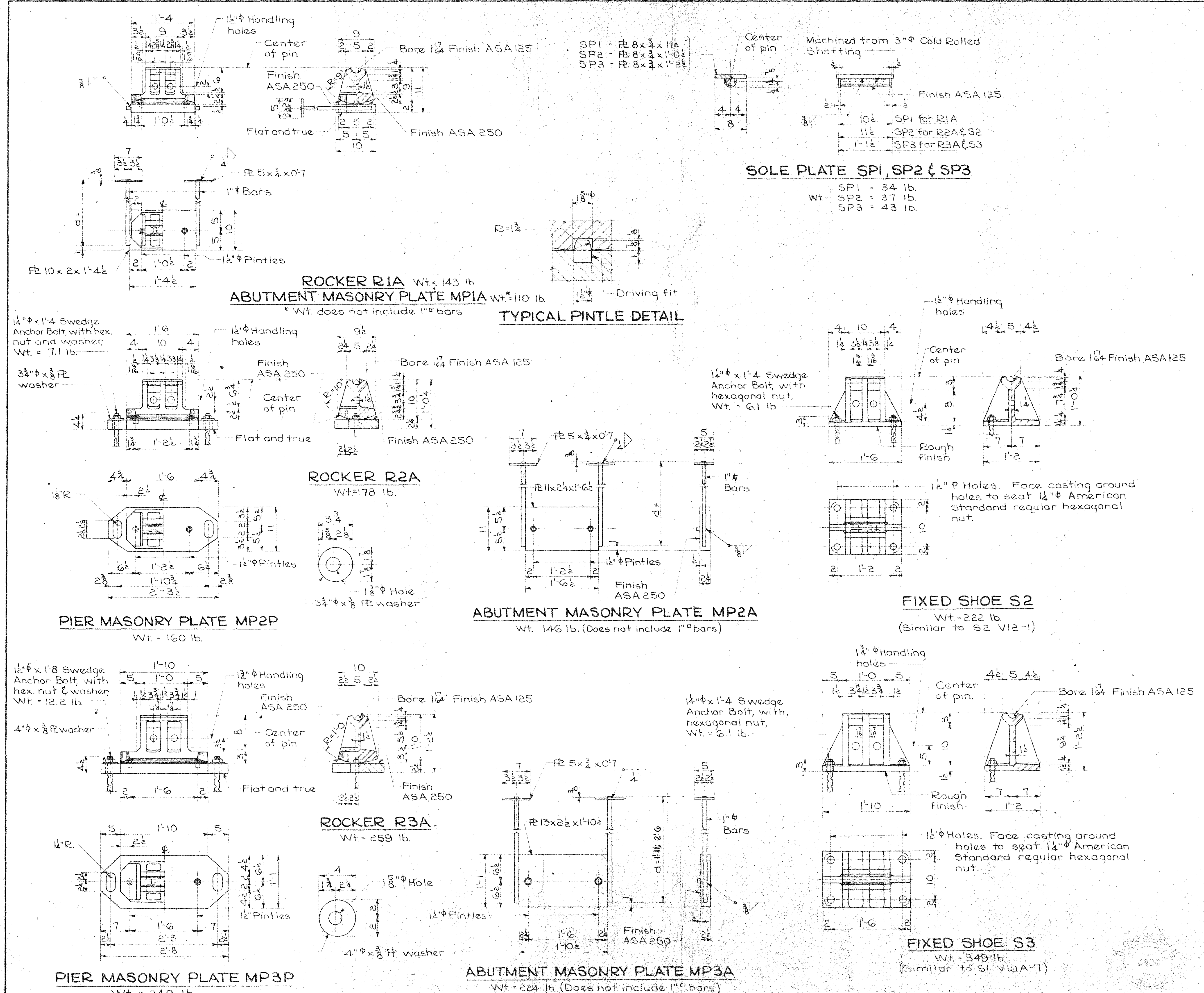
F



BEARING NOTES:

The casting of ~~R1A~~, ~~R2A~~, S2, R3A and S3P ~~shall~~ complied with Article 4153.04 of the I.H.C. Standard Specifications.

The masonry plates marked ~~MP1A~~, ~~MP2A~~, ~~MP2P~~, MP3A and ~~MP3P~~ ~~shall~~ complied with the requirements of ASTM A-36 steel.

The pins ~~shall~~ complied with Article 4153.02 of the I.H.C. Standard Specifications and with the requirements of ASTM A-108 steel.

All bearings ~~are to be~~ were set in paint and canvas.

Anchor bolts ~~shall be~~ were set in accordance with Article 2408.46 of the I.H.C. Standard Specifications.

After masonry plates, rockers and shoes ~~are~~ were in correct location, poured mortar around anchor bolts to fill the slotted holes.

The weight of bearings shown does not include the weight of paint.

Surfaces finished with an ASA 125 finish ~~shall be~~ were shop coated with an application of white lead and tallow as soon as the surfacing process is done. The shop coated surfaces ~~are to be~~ were wiped clean and then a field coat of white lead and tallow ~~is to be~~ was applied just before the erection of structural steel in the field.

DISTANCE FROM TOP OF SOLE PLATE TO BRIDGE SEAT

Rockers & Fixed Shoes	D*
R1A	1'-0 1/16
R2A & S2	1'-1 15/16
R3A & S3	1'-4 3/16

* Including 1/16" paint and canvas.

MAXIMUM REACTION (In Kips)

R1A	R2A S2	R3A S3
132	171	263

Note: Use SP3, R3A, and MP3A from this sheet for abutment bearing material.

Design for 20° Skew

DUAL 320'-0 x 30' CONTINUOUS WELDED GIRDER BRIDGES AND WELDED WIRE RETARD

97'-6 End Spans — 125'-0 Interior Span
Concrete Floor & Substructure — Tubular Handrail

BEARING DETAILS

Station 1301 + 20.00 — Project № FU-1065(10)

STORY COUNTY

Iowa State Highway Commission

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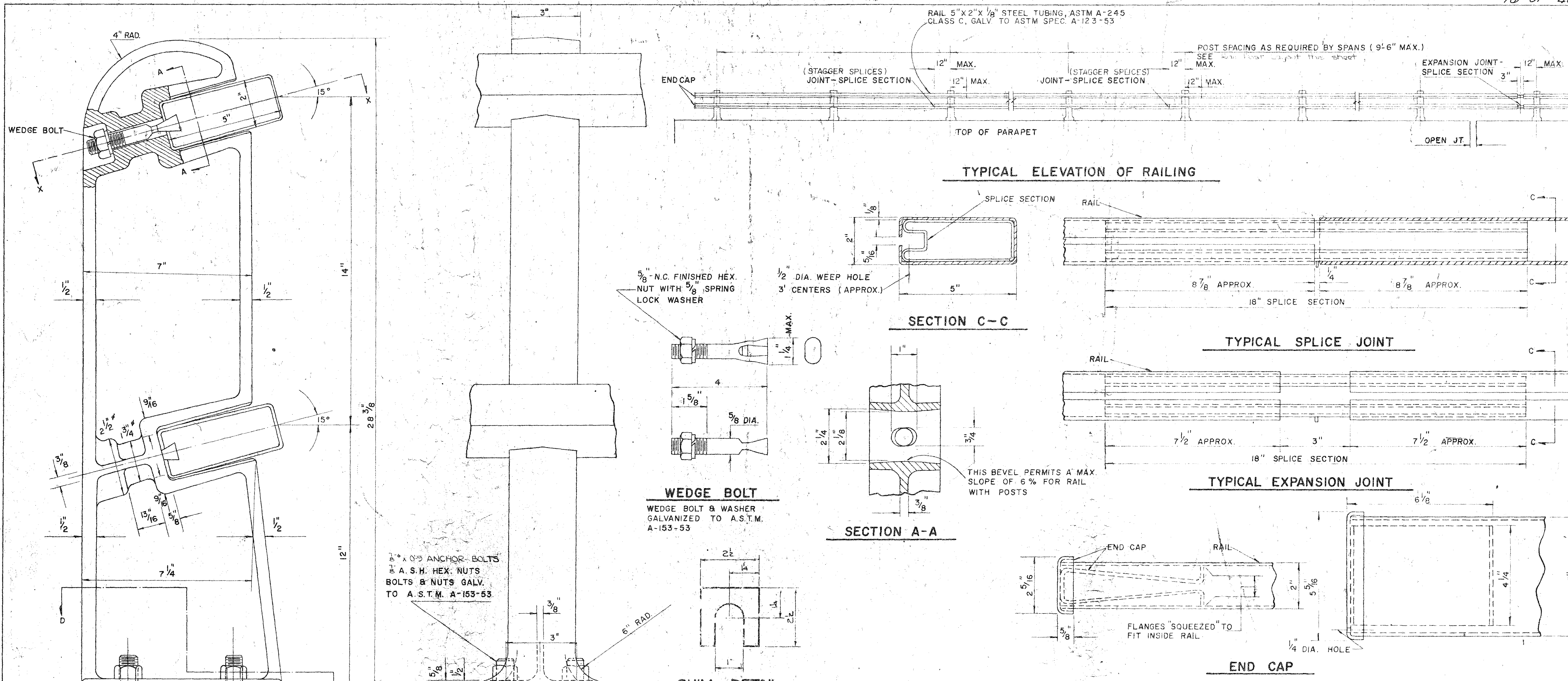
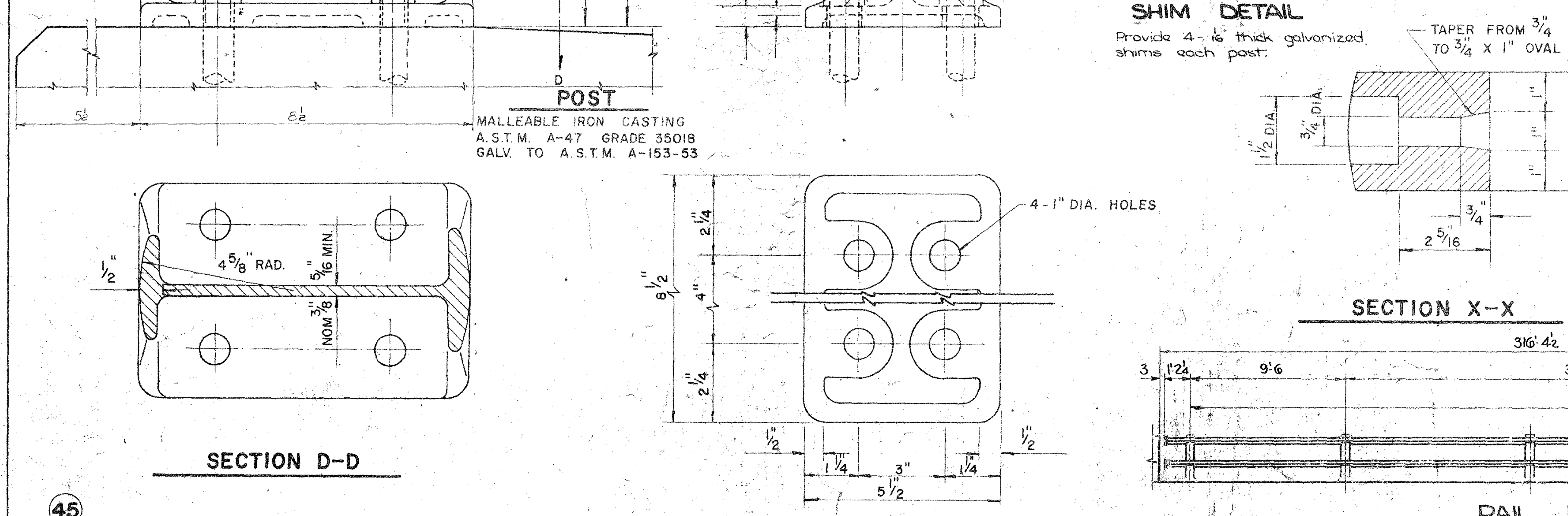
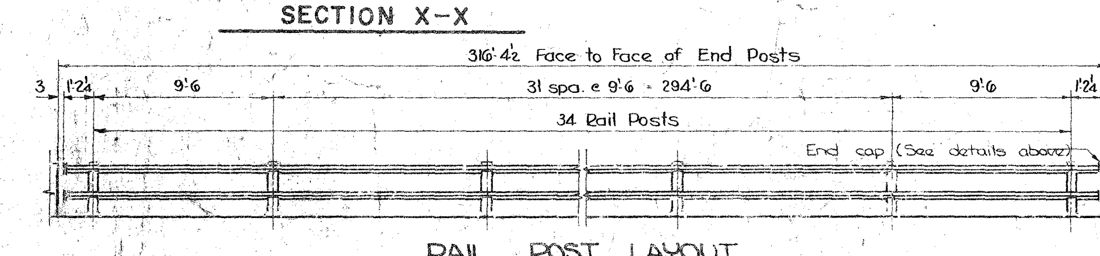
Design 3061 — Story County — File № 21508







STEEL HANDRAIL NOTES –

The steel handrail ~~is~~ will be bid on a lineal foot basis measured from centerline to centerline of end posts. The price bid for "Steel Handrail" shall be full compensation for furnishing all material including the anchor bolts and all equipment and labor required to erect the rail in accordance with these plans and Specifications.

No painting will be required.

For handling, storage and installation of steel handrail, Section 2414.06 of the Standard Specifications, shall applied.

Each rail section must pass thru at least three posts before being spliced, for as many rail sections as possible.

*STEEL HANDRAIL QUANTITIES					
Steel Handrail (℄-℄ End Posts)					1254.0 Lin. Ft.
If Steel Handrail is used, the superstructure reinforcing steel quantities shall be modified as noted at right.	Change	No.	Bar	Length	Weight
	+	36	5c2	2'-9	+104
	–	24	6c5	5'-6	-198
					-94

Note that anchor bolt spacing for steel rail posts is not the same as for aluminum posts.

* Quantities shown are for two bridges.

Design for 20° Skew

DUAL 320'-0 x 30' CONTINUOUS WELDED GIRDER BRIDGES AND WELDED WIRE RETARD

97'-6 End Spans | 125'-0 Interior Span
Concrete Floor & Substructure | Tubular Handrail

STEEL HANDRAIL DETAILS

Station 1301+20.00 | Project No. FU-1065(10)

STORY COUNTY

Iowa State Highway Commission

December 1962 | Sheet 15 of 15

Design 3061 | Story County | File No. 21508

Drawn by | Checked by: CEW

45

10-20-61
10-24-62 - Rails made continuous thru 3 posts

1 40

STATE OF IOWA
STATE HIGHWAY COMMISSION

DESIGN FOR

BRIDGES AND CULVERTS

PRIMARY ROAD SYSTEM

PROJECT NO. FU-1065(10)

STORY COUNTY

JANUARY, 1963

[redacted]

CONSTRUCTION PLANS SHOWING PROJECT AS BUILT

DATE 3-4-64 COPIES PREPARED 3

PREPARED BY Graeme C. George
RESIDENT ENGINEER

ONE COPY APPROVED & FORWARDED TO AMES
______ DIST. ENGR. ______ DATE.

TWO COPIES TO BE MADE & RETURNED TO :--
STEINER SILENCE DIST. ENGR.
ROBERT SHELQUIST RES. MAINT ENGR.

IN LETTING OF MARCH 5, 1963

STA. 1301+20.00 R-24W WASHINGTON TOWNSHIP US 30 OVER SKUNK RIVER

DUAL 320' X 30' CONTINUOUS WELDED GIRDER BRIDGES 20° SKEW

ESTIMATE OF QUANTITIES

ITEM	UNIT	TOTAL
Concrete	Cu. Yds.	1,272.0 ✓
Reinforcing Steel	Lbs.	~~267,444~~ ✓ 267350
Structural Steel	Lbs.	~~519,468~~ 572,310 ✓
Class 10 Channel Excavation	Cu. Yds.	1,600
Class 20 Excavation	Cu. Yds.	888 ✓
Class 21 Excavation	Cu. Yds.	520 ✓
Creosoted Piling 96 at 35'	Lin. Ft.	3,360 ✓
Untreated Piling (Oak or Gumwood) 192 at 35'	Lin. Ft.	6,720 ✓
OR ~~Aluminum Handrail (℄ - ℄ End Posts)~~	~~Lin. Ft.~~	OR ~~1248.0~~
Steel Handrail (℄ - ℄ End Posts)	Lin. Ft.	1254.0 ✓
Granular Backfill	Tons	897 ✓
Welded Wire Fabric Retard (℄ - ℄ End Piles includes Wingdams)	Lin. Ft.	840 ✓
Porous Backfill	Cu. Yds.	46 ✓

IN LETTING OF MARCH 5, 1963

DESIGN NO. 3261 T-83N R-24W STA. 1258+95.48 EAST BOUND LANE
SECTION 14 STA. 1259+02.23 WEST BOUND LANE
U. S. #30 RELOC. OVER U. S. #69 WASHINGTON TOWNSHIP

DUAL 211'-3 X 30' & VARIABLE ROADWAY PRETENSIONED PRESTRESSED CONCRETE BEAM BRIDGES 5° 31' SKEW

ESTIMATE OF QUANTITIES

ITEM		UNIT	TOTAL
Concrete		Cu. Yds.	~~901.1~~ 907.3
Reinforcing Steel	199115 ✓ ~~198663~~	Lbs.	~~197,294~~
Pretensioned Prestressed Concrete Beams	38' - 4" Special	Only	17 ✓
	42' - 6" B1	Only	18 ✓
	63' - 4" B6	Only	35 ✓
Creosoted Piling 169 at ~~30'~~ 16; 30 at ~~40'~~ 35; 33 at ~~45'~~ 35; 7 @ ~~16~~ 8		Lin. Ft.	4965 ~~7755~~ ~~7867~~
OR Aluminum Handrail (℄ - ℄ End Posts)		Lin. Ft.	814.6
~~Steel Handrail (℄ - ℄ End Posts)~~		Lin. Ft.	OR ~~814.0~~
Concrete Slope Protection		Sq. Yds.	~~894~~ 989.2
Class 20 Excavation		Cu. Yds.	756 ✓
Granular Backfill		Tons	285 ✓
4"Φ Tile Drain		Lin. Ft.	263 ✓
* 2"Φ Rigid Steel Conduit		Lin. Ft.	450 ✓
Creosoted Test Piling 2 at 30'		L. S.	Lump Sum ✓

* Includes 12 Lin. Ft. of 1"Φ Rigid Steel Conduit

IN LETTING OF MARCH 5, 1963

DESIGN	LOCATION: SECTION	TOWNSHIP	STATION	DESCRIPTION: SIZE AND TYPE	CONCRETE CUBIC YARDS	REINFORCING STEEL LBS.	EXCAVATION -- CUBIC YARDS: CLASS 20	CLASS 24		CLASS 10 CHANNEL		REMOVALS
3361	14	WASHINGTON	1249+85	6' X 4' X 254' Reinf. Conc. Box Culv. 30° Skew	204.0 ✓	20,743 ✓	426 ✓					
				TOTALS	204.0 ✓	20,743 ✓	426 ✓					

SPECIFICATIONS

CONSTRUCTION: Standard Specifications of the Iowa State Highway Commission, Series of 1960, plus current Supplemental Specifications and Special Provisions.

DESIGN STRESSES for the following materials are in accordance with A. A. S. H. O. Standard Specifications, Series of 1961.

Reinforcing Steel in accordance with Section 1.4.12 "Reinforcement" for Intermediate, Hard, or Rail Steel Grade.

Concrete in accordance with Section 1.4.11 f'_c = 3500 p.s.i.

Prestressed Concrete in accordance with Section 1.13.7 f'_c = 5000 psi.

Prestressing Steel in accordance with Section 1.13.7 f'_s = 250,000 psi.

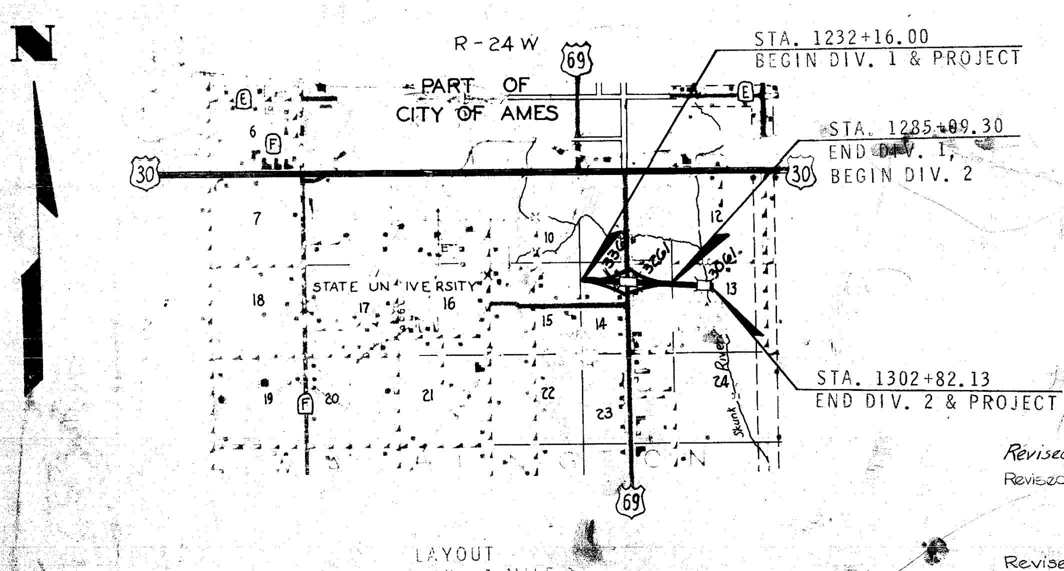
Design stresses for Structural Steel (A-36) to be in accordance with the Bureau of Public Roads Circular Memorandum entitled, "Unit Stresses for A.S.T.M. A-36 Carbon Steel and for Rivets and Bolts", dated August 17, 1962.

These bridges ~~will~~ require Bridge Sign Assemblies furnished and placed by others as specified in Traffic and Highway Planning Instruction No. 11, Revised October 1, 1961.

45-Sheets

FU-1065(10) APRIL-2/63 LET

N



LAYOUT
SCALE 1" = 1 MILE

MILEAGE SUMMARY 105-1

DIV.	LOCATION	LIN. FT.	MILES
	BRIDGE AT STA. 1258+98.85	214.094	.040
	BRIDGE AT STA. 1301+20.00	324.792	.062
	TOTAL		.102

DEPUTY

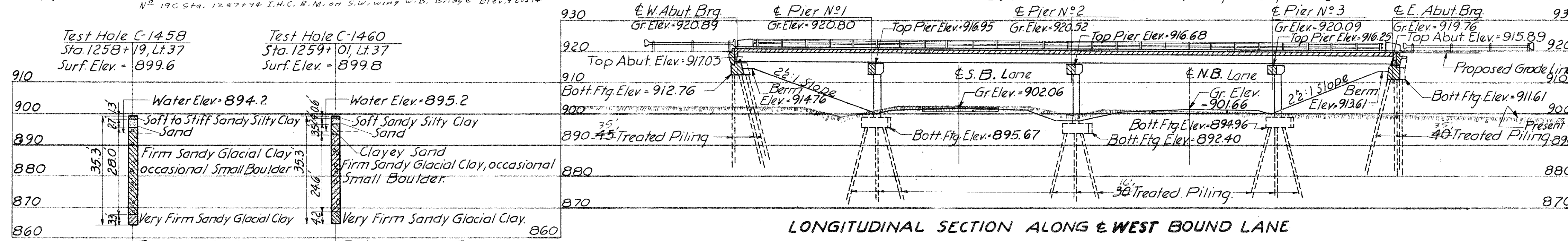
DIVISION

Revised 7-22-63: Sheet 7a of 23 Design 3261 added for corrected footing layout, quantities changed on sheets 1 and 7 of 23.
Revised 6-10-63 Design 3261: Number and weight of bars 5g1 corrected on Sh.# 2 & 3 of 23.
Number and weight of bars 5c1 & 5c2-7 corrected on Sh# 6 of 23.

Revised 5-6-63 Design 3061: Structural Steel quantity corrected on sheets 1 & 10
Revised 2-27-63 Design 3061: Structural Carbon Steel designation changed for minor members; Notes on Sheets 1 & 11 changed.

Story US 30 #7

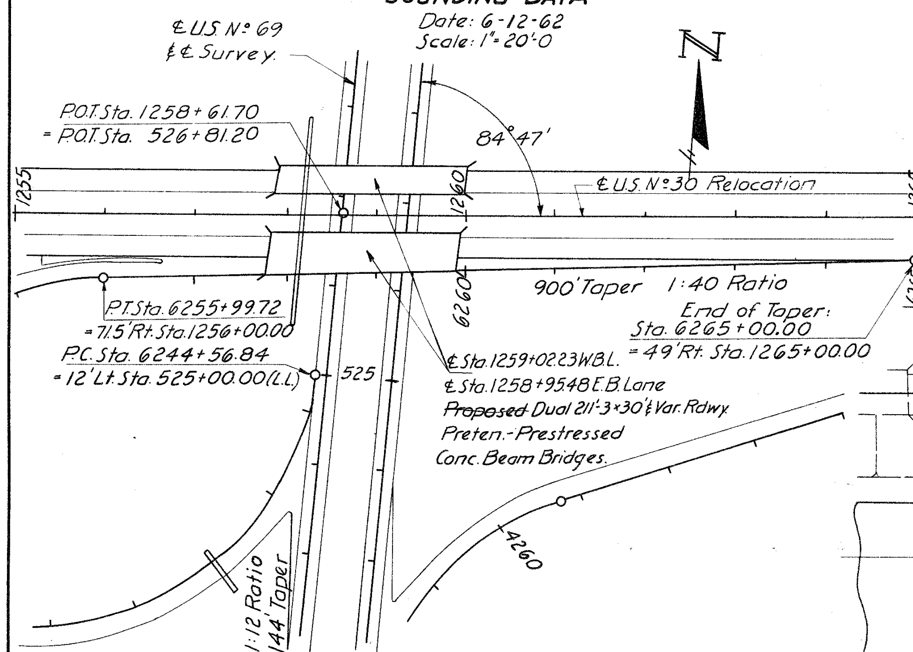
COUNTY STORY PROJECT NO. FU-1065 (10) FILE NO. 21308



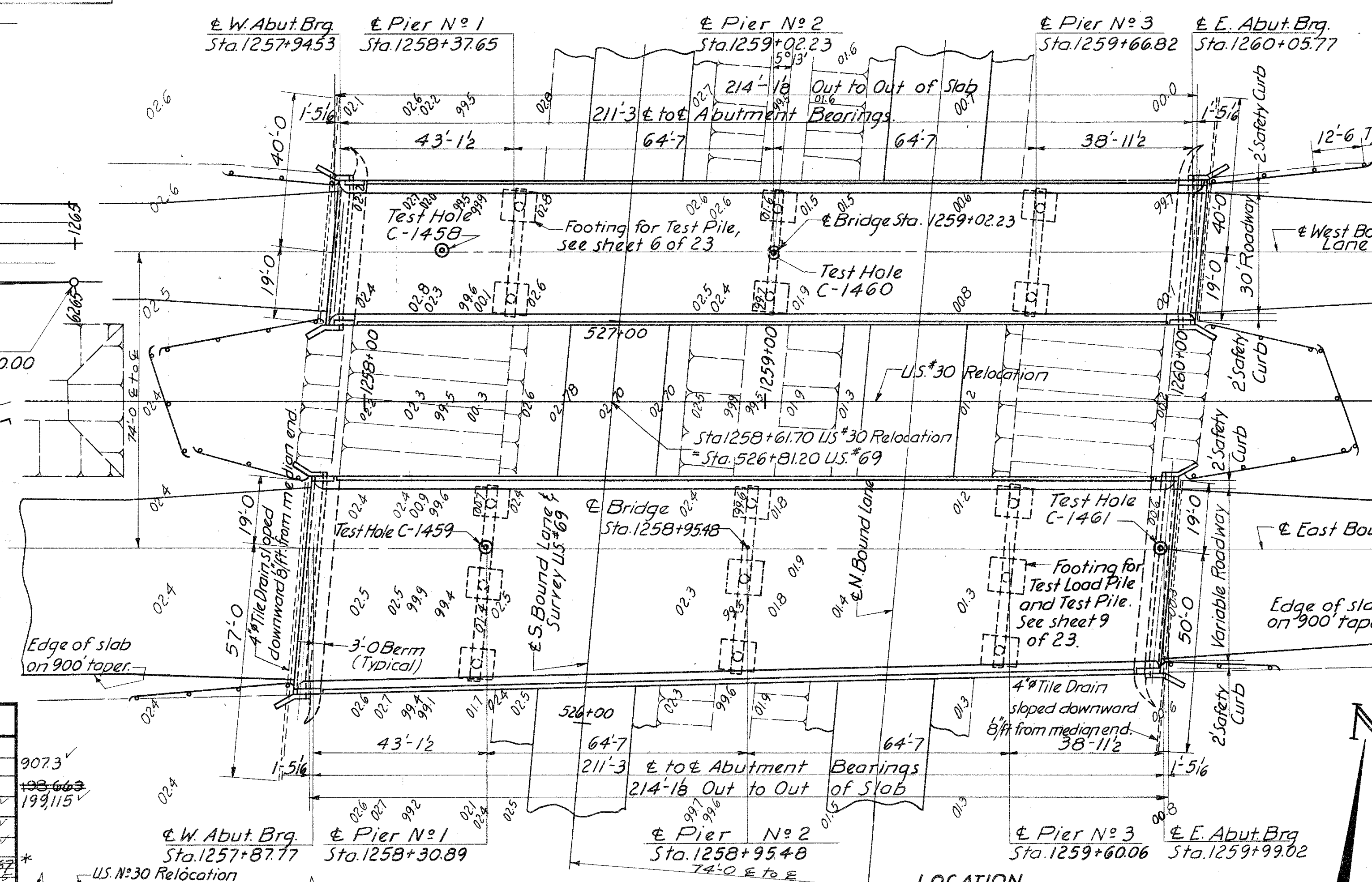
U.S. No. 30 GRADE DATA: P.I. Sta. 1259+00, Elev. = 928.47; +1.904%; −2.978%; M.o. = 7.93; V.C. = 1300'

U.S. No. 69 S.B. LANE GRADE DATA: +0.355%; Elev. = 900.40 Sta. 522+50

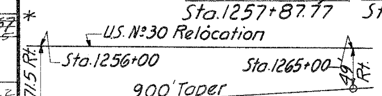
U.S. No. 69 N.B. LANE GRADE DATA: +0.42%; Elev. = 899.69 Sta. 522+50



GENERAL PLAN
Scale: 1" = 100'



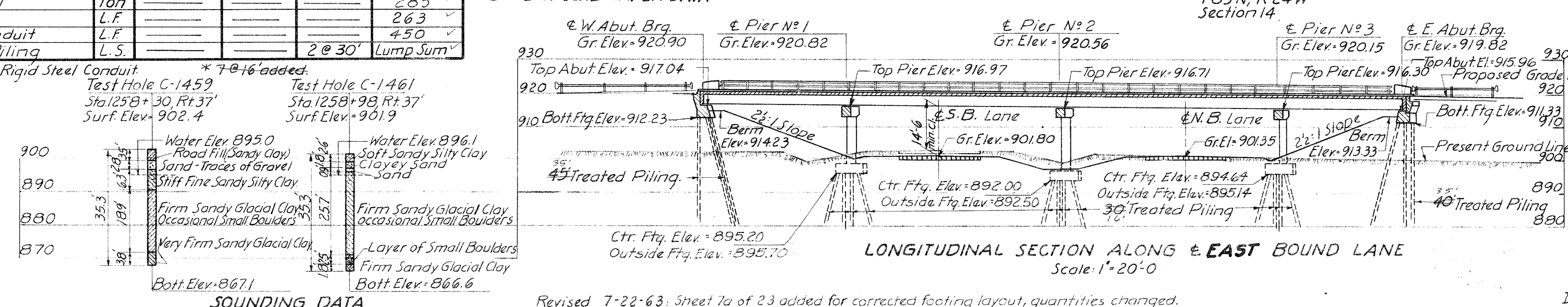
SITUATION PLAN
Scale: 1" = 20'-0



EDGE OF SLAB TAPER DATA

Item		Unit	2 Superstr.	4 Abuts	6 Piers	Total
Concrete		c.y.	494.4	131.2	~~275.5~~ 281.7	~~901.1~~ 907.3
Reinforcing Steel		lb.	137,895	~~13,392~~ 13,510	~~46,007~~ ~~47,258~~ 47,710	~~197,294~~ ~~198,663~~ 199,115
Pretens. Prestr. Conc. Beam-Special (38'-4)		only	17			17
" " " " B1 (42'-6)		only	18	—	—	18
" " " " B6 (63'-4)		only	35	—	—	35
Creosoted Piling		L.F.	—	30 @ ~~40'~~ 35'; 33 @ ~~45~~ 35	169 @ ~~30'~~ 72'; 7 @ 8	~~7755~~ 7867 4965*
Aluminum Handrail or ~~Steel Handrail~~	℄-℄ End Posts	L.F.	—	—	—	814.6
		L.F.	—	—	—	or ~~814.0~~
Concrete Slope Protection		Sq. Yd.	—	—	—	~~894~~ 985.2
Class 20 Excavation		c.y.	—	370	386	756
Granular Backfill		ton	—	—	—	285
4" ø Tile Drain		L.F.	—	—	—	263
*2" ø Rigid Steel Conduit		L.F.	—	—	—	450
Creosoted Test Piling		L.S.	—	—	2 @ 30'	Lump Sum

*Includes 12 L.F. of 1" ø Rigid Steel Conduit. * ~~7 @ 16' added.~~



LONGITUDINAL SECTION ALONG ℄ EAST BOUND LANE
Scale: 1" = 20'-0

LOCATION.
U.S. #30 Reloc. over U.S. #69
Story County
Washington Twp.
T83N, R24W
Section 14

GENERAL NOTES.

These bridges ~~are~~ were designed for H20-16 loading plus 19 lbs. per sq. ft. of roadway for future wearing surface.

The approach fills ~~are~~ were not a part of this contract, but they ~~are to be~~ were in place before abutment piles are driven. Abutment piles ~~are to be~~ were driven through predrilled holes through the approach fills to elevation 902.0. The minimum diameter of the drilled holes ~~is to be~~ was 4 inches greater than the diameter of the pile 3 feet from the butt. Voids around piles ~~are to be~~ were filled with dry sand. No seperate payment ~~will be~~ was made for drilling holes or filling voids since it ~~is~~ was considered incidental to driving piles.

The Bridge Contractor ~~is to~~ leveled and shaped the berms to the elevations shown.

The formed steel beam guard rail and treated posts ~~are~~ were not a part of this contract and will be furnished and placed by others.

The Bridge Contractor ~~is to~~ installed the tile drain behind each abutment as detailed. The price bid for "Tile Drain" ~~is to~~ included the excavation necessary for installation.

Bridge excavation quantities ~~are~~ were based on the assumption that roadway cut and fill ~~will be~~ was completed by others before the bridge construction ~~is~~ was started.

The concrete surface finish ~~shall~~ complyd with Article 2403.28 of the standard specifications.

~~The lengths shown for Creosoted Piling are estimated lengths for bidding purposes only and~~ two test pile ~~shall be~~ were driven before ordering any piling.
See sheet 6 & 9 of 23 for Test Load Pile Notes and procedure.

DESIGN STRESSES.

Design stresses for the following materials are in accordance with A.A.S.H.O. Standard Specifications for Highway Bridges, Series of 1961.

Reinforcing Steel in accordance with Sec. 1.4.12 "Reinforcement" for Intermediate, Hard or Rail Steel Grade.
Concrete in accordance with Sec. 1.4.11 f'c = 3500 psi.
Prestressed Beam Materials, See Sheet #10.

SPECIFICATIONS.

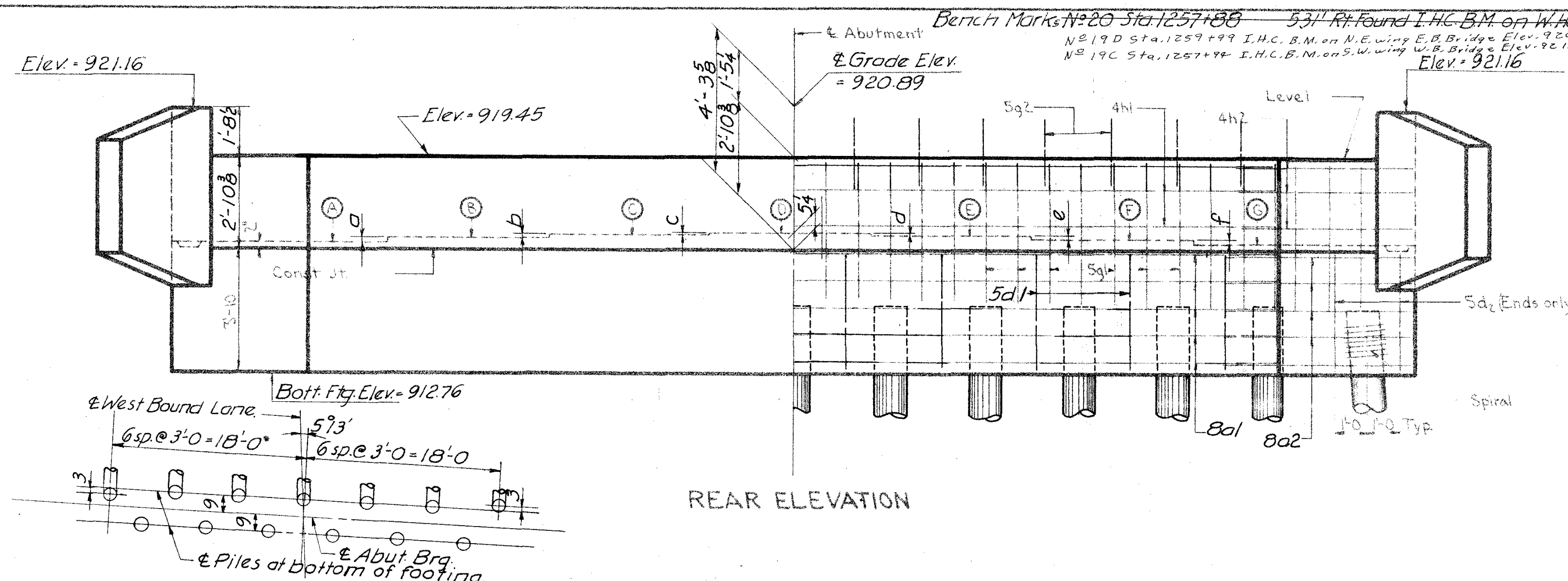
Design: A.A.S.H.O., Series of 1961.
Construction: Standard Specifications of the Iowa State Highway Commission, Series of 1960, plus current supplemental specifications and special provisions.

Design for 5°13' Skew
DUAL 211'-3 × 30' & VAR. RDWY. PRETENSIONED PRESTRESSED CONCRETE BEAM BRIDGES
43'-1½ & 38'-11½ End Spans 2-64'-7 Interior Spans
Concrete Floor & Substructure Tubular Rail
GENERAL & SITUATION PLAN
Sta. 1258+95.48 E. Bound Lane
Sta. 1259+02.23 W. Bound Lane Project No. FU-1065(10)
STORY COUNTY
Iowa State Highway Commission
September 1962 Sheet 1 of 23
Design No. 3261 Story County File No. 21508

Revised 7-22-63: Sheet 7a of 23 added for corrected footing layout, quantities changed.
Revised 6-10-63: Number and weight of bars in Pier and Abutment corrected.

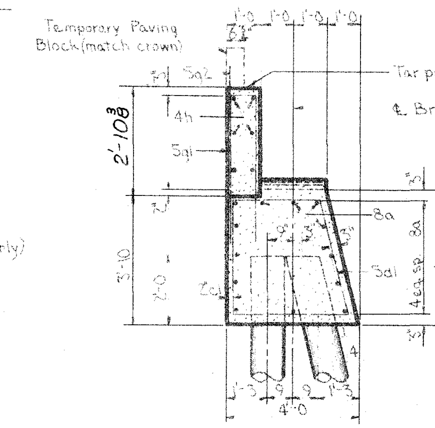
Designed by: B.F. Traced by: ~~[illegible]~~ Checked by: [illegible]

Bench Marks: No. 20 Sta. 1257+88 — 53' Rt. Found I.H.C. B.M. on W. Hdwl. 4×2 R.C.B. Elev. 895.67
No. 19D Sta. 1257+99 I.H.C. B.M. on N.E. wing E.B. Bridge Elev. 920.11
No. 19C Sta. 1257+94 I.H.C. B.M. on S.W. wing W.B. Bridge Elev. 921.14



REAR ELEVATION

PILING LAYOUT



SECTION AT ℄ ROADWAY

Note: Spirals at the top of each pile – 7 turns of ¼" ϕ rod; 21" diameter, 3" pitch with 2 – ⅞ [0.69# spacers punched to hold spiral. Before placing the temporary paving block, contractor bent ~~bend~~ down all 5g2 bars and covered the top of the backwall with tar paper to prevent bond.

ABUTMENT NOTES:

All exposed corners of 90° or sharper were ~~are to be~~ filleted with a ¾" dressed and beveled strip.

Reinforcing steel was ~~is to be~~ securely wired in place before concrete was ~~is~~ poured.

Clear distance from face of concrete to near reinforcing bar is ~~to be~~ 2" unless otherwise noted or shown.

Piling was ~~shall be~~ driven to full penetration if practicable but to at least 20 ton minimum but no more than 40 ton maximum bearing value.

Bridge contractor ~~is to~~ backfilled abutments between wingwalls to subgrade elevation with granular backfill material complying with Section 4133 of the Standard Specifications.

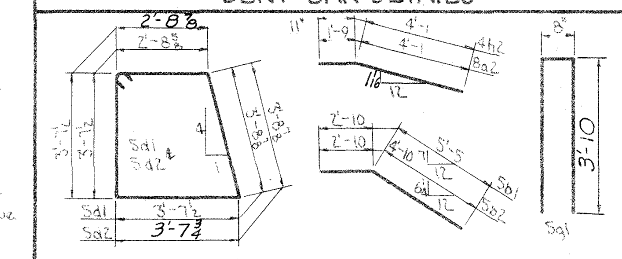
SPECIFICATIONS:

Design: A.A.S.H.O. Series of 1961. See Sheet #1 for Stresses.

Construction: Iowa State Highway Commission Standard Specifications, Series of 1960, plus current special provisions and current Supplemental Specifications.

REINFORCING STEEL – ONE ABUTMENT						
Bar	Location		Shape	No.	Length	Weight
8a1	Footing Longitudinal		——	13	29'-11	1038
8a2	" "	Ends	——\	26	5'-10	405
5b1	Wing Horizontal	B.F.	——\	12	8'-3	103
5b2	" "	F.F.	——\	12	7'-8	96
5c1	" Vertical	F.F.	——	8	5'-4	44
8c2	" "	B.F.	——	14	5'-11	221
5c3	" "	Both Face	——	20	Varies	87
5d1	Footing Hoops		□	10	14'-5	150
5d2	Footing Hoops (Ends Only)		□	4	14'-6	60
5g1	Backwall Vertical		⊓	37 ~~30~~	8'-2	~~256~~ 315
* 5g2	Paving Dowels		——	15	2'-0	31
4h1	Backwall Horizontal		——	6	29'-11	120
4h2	" "	End	——\	12	5'-0	40
	Pile Spirals ¼" ϕ Rod		ℓℓℓℓℓℓ	13	38'-6	84
	Spiral Spacers ⅞ [0.69#		——	26	1'-10	33
*	Structural Grade					
	Total				lbs.	~~2768~~ 2827

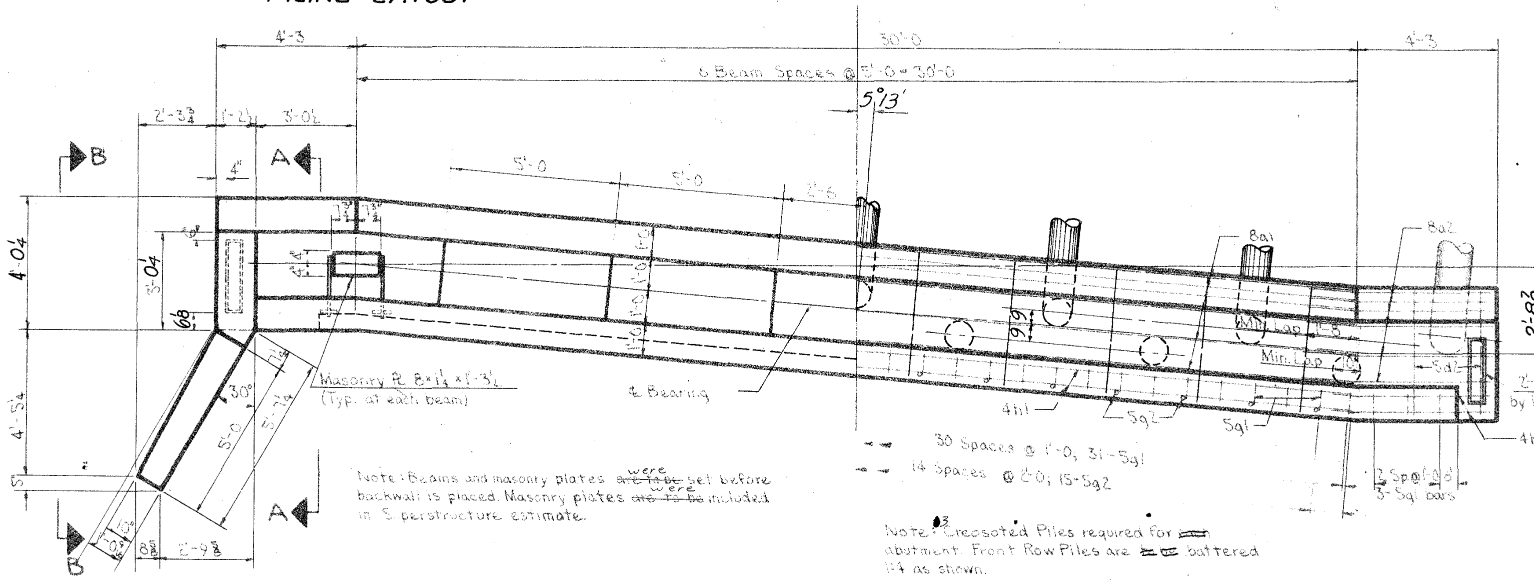
BENT BAR DETAILS



All bar dimensions are out to out.

CONC. PLACEMENT QUANT. – ONE ABUT.		
Footing (Includes Steps)	19.5	c.y.
Backwall	3.6	"
Wings	2.9	"
Paving Block	0.9	"
Total	26.9	c.y.

ESTIMATED QUANTITIES – ONE ABUTMENT		
Concrete	Cu. Yd.	26.9
Reinforcing Steel	lbs.	~~2768~~ 2827
Creosoted Piles 13 @ ~~45'~~ 35'	Lin. Ft.	~~585~~ 455
Class 20 Excavation	Cu. Yd.	77
Granular Backfill	Tons	54



Note: Beams and masonry plates were ~~are to be~~ set before backwall is placed. Masonry plates were ~~are to be~~ included in Superstructure estimate.

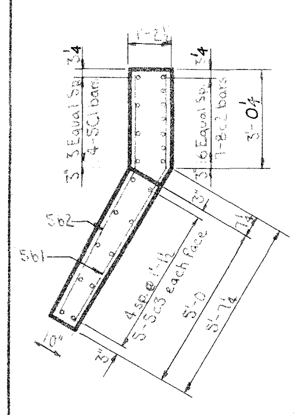
Note: 13 Creosoted Piles required for abutment. Front Row Piles are battered 1:4 as shown.

HALF PLAN — HALF FOOTING PLAN WITH BACKWALL

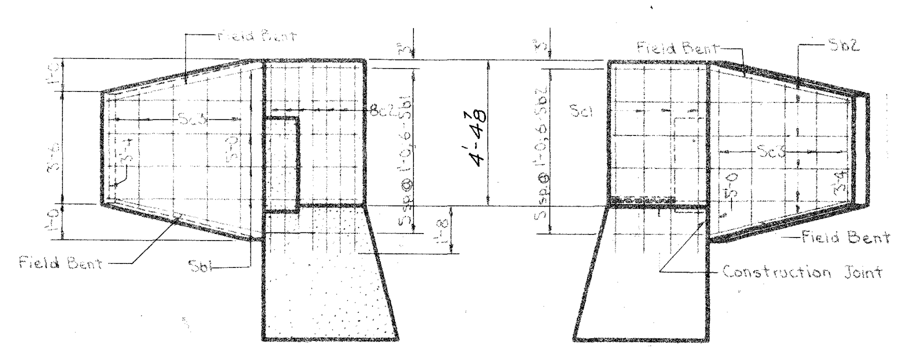
Scale ⅜" = 1'-0

ABUT. ELEV.			ABUT. STEPS	
Pt.	W. Abut.	E. Abut.	Pt.	West Abut.
A	916.76		a	1 1/16
B	916.90		b	1 3/16
C	917.00		c	3/8
D	917.03		d	3/8
E	917.00		e	1/8
F	916.91		f	1 1/16
G	916.76			

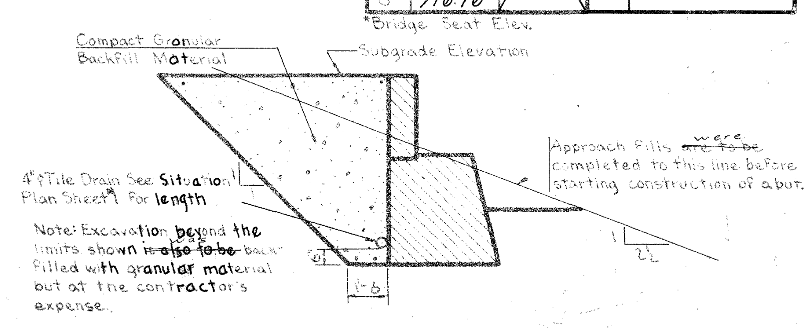
*Bridge Seat Elev.



WING PLAN



SECTION A-A — VIEW B-B



SECTION SHOWING SPECIAL BACKFILL

Revised 6-10-63: Number and weight of bars 5g1 corrected.

This sheet is for 30' rdwy. pretens'd prestr'd Bridges. 7PC60B beam X-section. 13 piles (8 front, 5 back) will work for 53'-1½ end span with skews 0°00' thru 7°30' LT.
Revised 1-3-63: Specifications changed, Pile bearing value changes.

Design for 5°13' Skew

DUAL 211'-3 × 30' & VAR. RDWY. PRETENSIONED PRESTRESSED CONCRETE BEAM BRIDGES

End Spans 43'-1½ & 38'-11½ — 2-64'-7 Interior Spans

Concrete Floor & Substructure — Tubular Rail

WEST BOUND LANE – WEST ABUTMENT DETAILS

Station 1259+02.23 W.B. Lane — Project No. FU-1065 (10)

STORY COUNTY

Iowa State Highway Commission

September 1962 — Sheet 2 of 23

Design No. 3261 — Story County — File No. 21508

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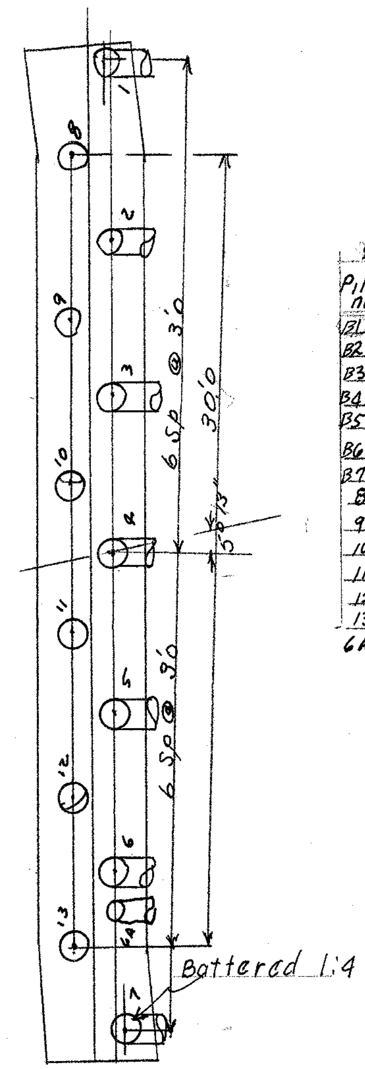


West Abutment West Bound Lane

Pile no.	Date Driven	Length in Leads nearest ft.	Length cut off nearest 1/10 ft	Length in Structure	Ave. Pen. last 5 blows (inches)	Drop in feet	Bearing in tons
B1	6-27-63	35	1.2	33.8	0.80	10	28.8
B2	6-27-63	35	11.2	23.8	R	10	—
B3	6-27-63	35	10.9	24.1	0.40	10	42.6
B4	6-27-63	35	9.9	25.1	0.40	10	42.6
B5	6-27-63	35	1.5	33.5	1.30	10	19.3
B6	6-27-63	35	17	18	broke		
B7	6-27-63	35	4.2	30.8	0.775	10	28.4
8	6-27-63	35	7.6	27.4	0.475	10	41.0
9	6-26-63	35	0.6	34.4	0.70	10	32.2
10	6-26-63	35	0.9	34.1	0.45	10	42.2
11	6-26-63	35	4.3	30.7	0.35	10	48.3
12	6-26-63	35	7.5	27.5	0.225	10	59.3
13	6-26-63	35	1.1	33.9	0.60	10	35.6
6A	6-28-63	~~35~~ 30	1.2	28.8	0.90	10	27.3

35 ft. Piles

Type hammer - Gravity

Gross Weight - 3643

Weight of pile - 1336

I.H.C. hammer № - 749

Effective Weight - 3600

I.H.C. cap № - 788

Weight of cap - 992

Formula used - $P = \frac{3WH}{S+0.35} \times \frac{W}{W+M}$ Vert

$$P = \frac{(3)(1.8)(10)}{S+0.35} \times \frac{3600}{5928}$$

$$P = \frac{54}{S+0.35} \times 0.6073$$

$$P = \frac{33.79}{S+0.35} \text{ Vert.}$$

(") 0.946 Batt. 1:4

30 ft. Piles

Type hammer - Gravity

Gross Weight - 3643

Weight of pile - 1136

I.H.C. hammer № - 749

Effective weight - 3600

I.H.C. cap № - 788

Weight of cap - 992

Formula used - $P = \frac{3WH}{S+0.35} \times \frac{W}{W+M}$ Vert.

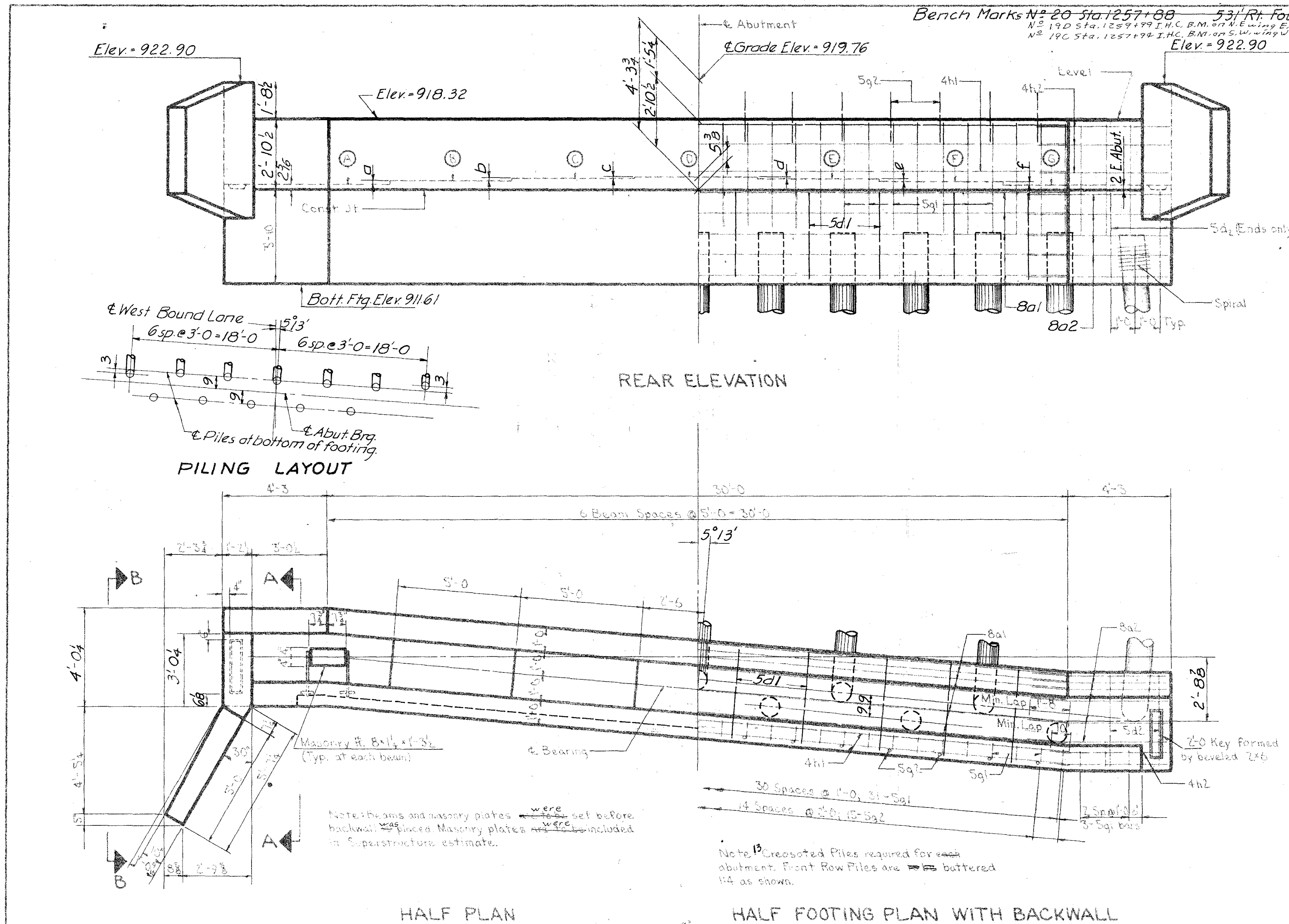
$$P = \frac{(3)(10)(1.8)}{S+0.35} \times \frac{3600}{5728}$$

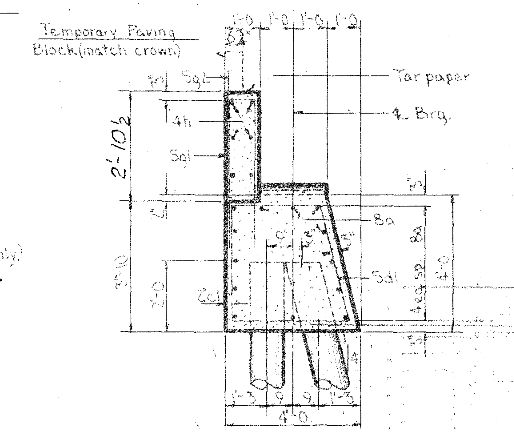
$$P = \frac{54}{S+0.35} \times 0.628$$

$$P = \frac{33.91}{S+0.35} \text{ Vert.}$$

(") 0.946 Batt. 1:4

Bench Marks ~~No. 20 Sta. 1257+88 — 531' Rt. Found I.H.C. B.M. on W. Hdwl. 4×2 RCB, Elev.=895.67~~
No. 190 Sta. 1259+99 I.H.C. B.M. on E. wing E.B. Bridge Elev. 920.11
No. 190 Sta. 1257+97 I.H.C. B.M. on S.W. wing W.B. Bridge Elev. 921.14
Elev.=922.90





Note: Spirals at the top of each pile – 7 turns of ¼" ⌀ rod; 21" diameter, 3" pitch with 2-⅞ [0.69# spacers punched to hold spiral. Before placing the temporary paving block, contractor bent ~~bend~~ down all 5g2 bars and covered the top of the backwall with tar paper to prevent bond.

ABUTMENT NOTES:

All exposed corners of 90° or sharper were ~~are to be~~ filleted with a ¾" dressed and beveled strip.

Reinforcing steel was ~~is to be~~ securely wired in place before concrete was ~~is to~~ poured.

Clear distance from face of concrete to near reinforcing bar is ~~to be~~ 2" unless otherwise noted or shown.

Piling was ~~shall be~~ driven to full penetration if practicable but to at least 20 ton minimum but no more than 40 ton maximum bearing value.

Bridge contractor ~~is to~~ backfilled abutments between wingwalls to subgrade elevation with granular backfill material complying with Section 4133 of the Standard Specifications.

SPECIFICATIONS:

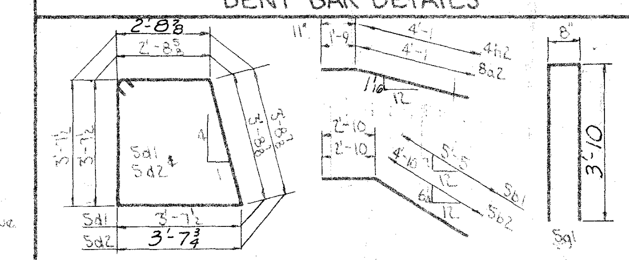
Design: A.A.S.H.O. Series of 1961. See Sheet #1 for Stresses.

Construction: Iowa State Highway Commission Standard Specifications, Series of 1960, plus current special provisions and current Supplemental Specifications.

REINFORCING STEEL – ONE ABUTMENT

Bar	Location		Shape	No.	Length	Weight
8a1	Footing Longitudinal		straight	13	29'-11	1038
8a2	" "	Ends	bent	26	5'-10	405
5b1	Wing Horizontal	B.F.	bent	12	8'-3	103
5b2	" "	F.F.	bent	12	7'-8	96
5c1	" Vertical	F.F.	straight	8	5'-4	44
8c2	" "	B.F.	straight	14	5'-11	221
5c3	" "	Both Faces	straight	20	Varies	87
5d1	Footing Hoops		□	10	14'-5	150
5d2	Footing Hoops (Ends Only)		□	4	14'-6	60
5g1	Backwall Vertical		⊓	37 ~~30~~	8'-2	~~256~~ 315
* 5g2	Paving Dowels		straight	15	2'-0	31
4h1	Backwall Horizontal		straight	6	29'-11	120
4h2	" "	End	bent	12	5'-0	40
	Pile Spirals ¼" ⌀ Rod		spiral	13	38'-6	84
	Spiral Spacers ⅞ [0.69#		straight	26	1'-10	33
*	Structural Grade					
	Total				lbs.	~~2768~~ 2827

BENT BAR DETAILS



All bar dimensions are out to out.

CONC. PLACEMENT QUANT. – ONE ABUT.

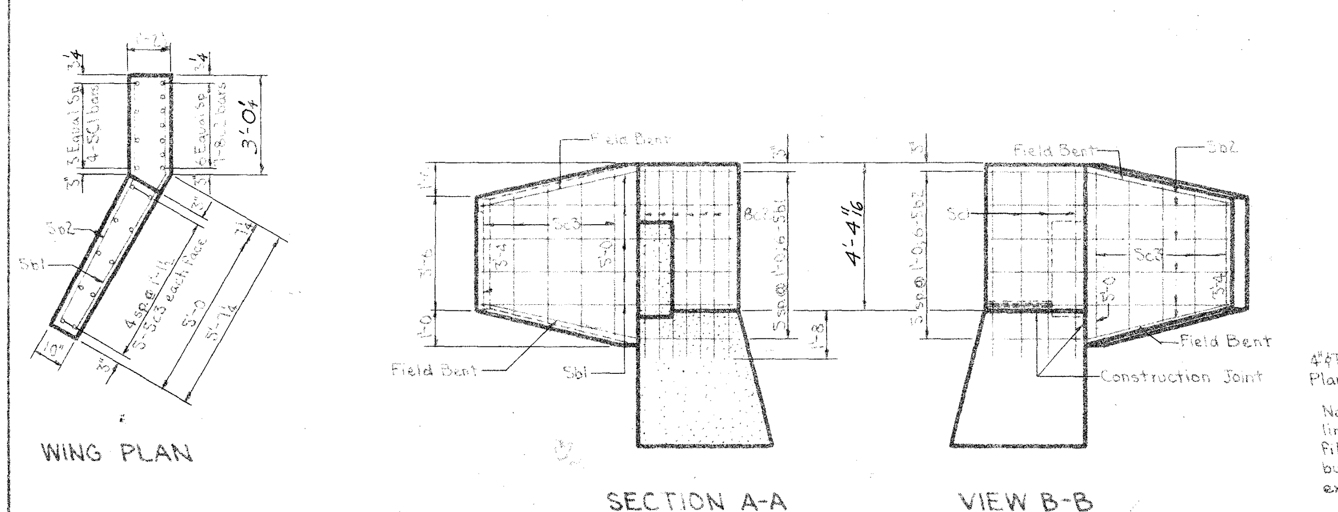
Footing (Includes steps)	19.5 c.y.
Backwall	3.6 "
Wings	2.9 "
Paving Block	0.9 "
Total	26.9 c.y.

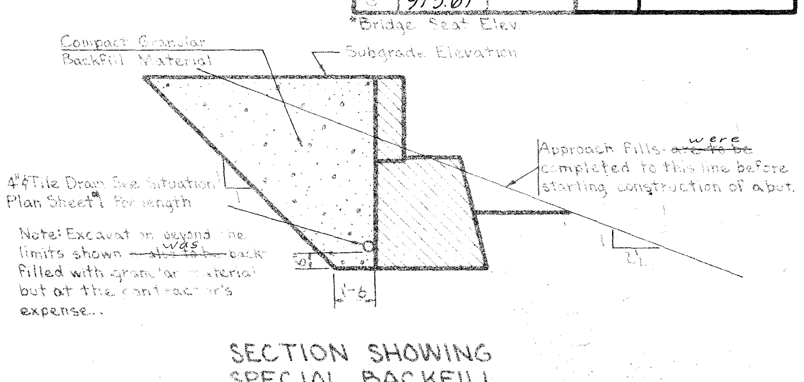
ESTIMATED QUANTITIES – ONE ABUTMENT

Concrete	Cu. Yd.	26.9
Reinforcing Steel	lbs.	~~2768~~ 2827
Creosoted Piles 13 @ ~~40'~~ 35'	Lin. Ft.	~~520~~ 455
Class 20 Excavation	Cu. Yd.	77
Granular Backfill	Tons	54

ABUT. ELEV.			ABUT. STEPS	
Pt.	E. Abut.	Abut.	Step	East Abut.
A	915.64		a	1 1/16
B	915.78		b	1/16
C	915.87		c	5/16
*D	915.89		d	3/8
E	915.86		e	1 3/16
F	915.76		f	1 13/16
G	915.61			

*Bridge Seat Elev.





Revised 6-10-63: Number and weight of bars 5g1 corrected.

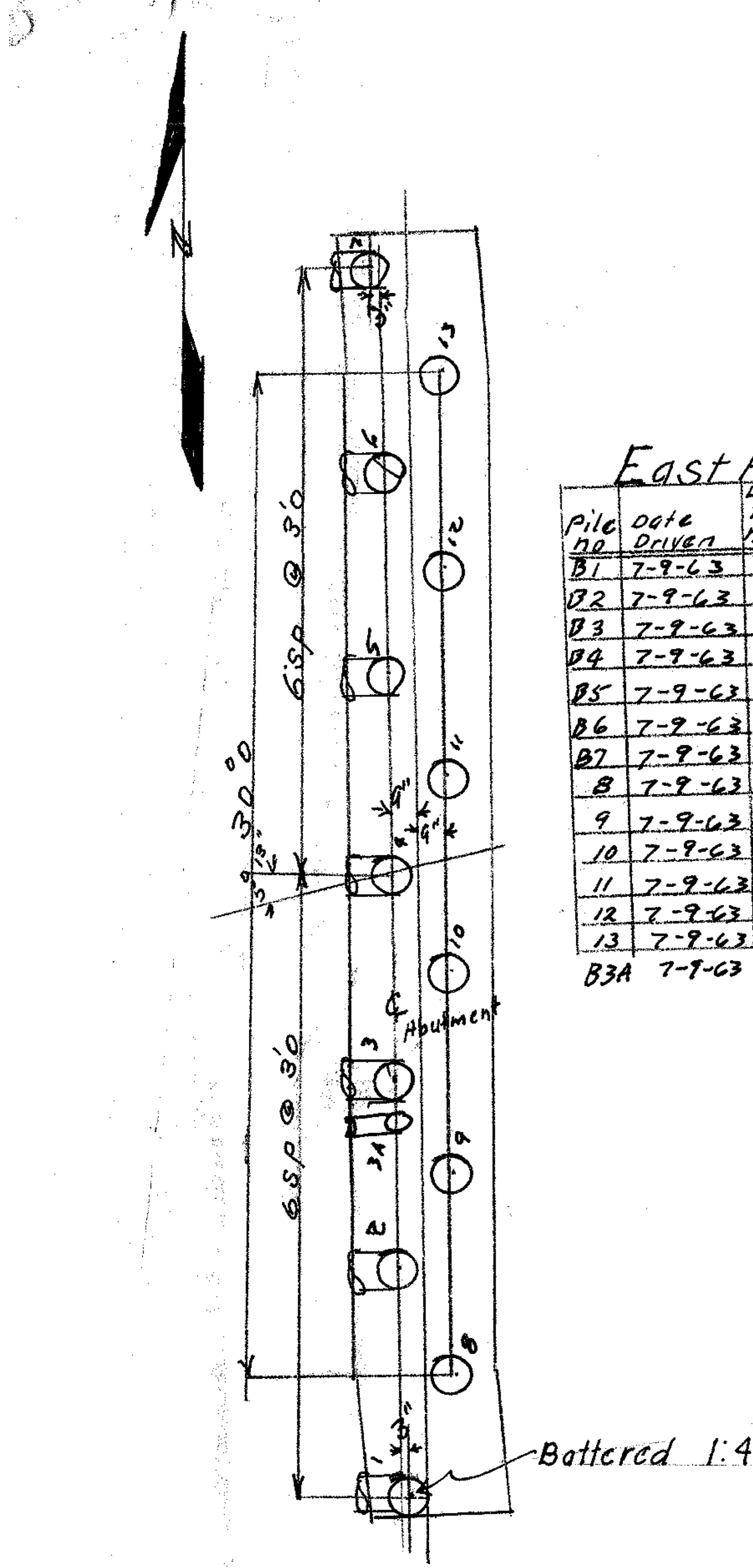
This sheet is for 30' rdwy. pretend. prest'd Bridges. TPC60B beam X-section. 13 piles (8 front, 5 back) will work for 55'-1½ end span with skews 0°00 thru 7°30 L.F.

Revised 1-3-62: Specifications changed, Pile bearing value changed.

Design for 5°13' Skew
DUAL 211'-3 × 30' & VAR. RDWY. PRETENSIONED
PRESTRESSED CONCRETE BEAM BRIDGES
End Spans 43'-1½ & 38'-11½ — 2-64'-7 Interior Spans
Concrete Floor & Substructure — Tubular Rail
WEST BOUND LANE — EAST ABUTMENT DETAILS
Station 1259+02.23 W.B. Lane — Project No. F.U.-1065(10)
STORY COUNTY
Iowa State Highway Commission
September 1962 — Sheet 3 of 23

Design No. 3261 — Story County — File No. 21508
Designed by: B.F. — Traced by: [illegible] — Checked by: RDU

2010



East Abutment West Bound Lane

Pile no	Date Driven	Length in leads nearest ft.	Length cut off nearest .1 ft	Length in Structure	Ave. Pen last 5 blows	Drop in feet	Bearing in tons
B1	7-9-63	35	1.5	33.5	0.55	10	35.6
B2	7-9-63	35	12.6	22.4	0.375	10	44.1
B3	7-9-63	35	9.7	25.3	broke		
B4	7-9-63	35	1.1	33.9	1.00	10	23.6
B5	7-9-63	35	13.6	21.4	R	10	—
B6	7-9-63	35	1.5	33.5	0.75	10	29.0
B7	7-9-63	35	12.1	22.9	0.35	10	45.6
8	7-9-63	35	1.2	33.8	0.79	10	30.7
9	7-9-63	35	1.4	33.6	0.85	10	28.1
10	7-9-63	35	1.2	33.8	1.35	10	19.9
11	7-9-63	35	6.1	28.9	1.225	10	20.2
12	7-9-63	35	8.2	26.8	0.30	10	52.0
13	7-9-63	35	12.0	23.0	R	10	—
B3A	7-9-63	35	1.4	33.6	0.60	10	33.6

35 ft. Piles

Type hammer - Gravity

Gross Weight - 3643

Weight of pile - 1336

I.H.C. Hammer Nº - 749

Effective weight - 3600

I.H.C. cap Nº. 788

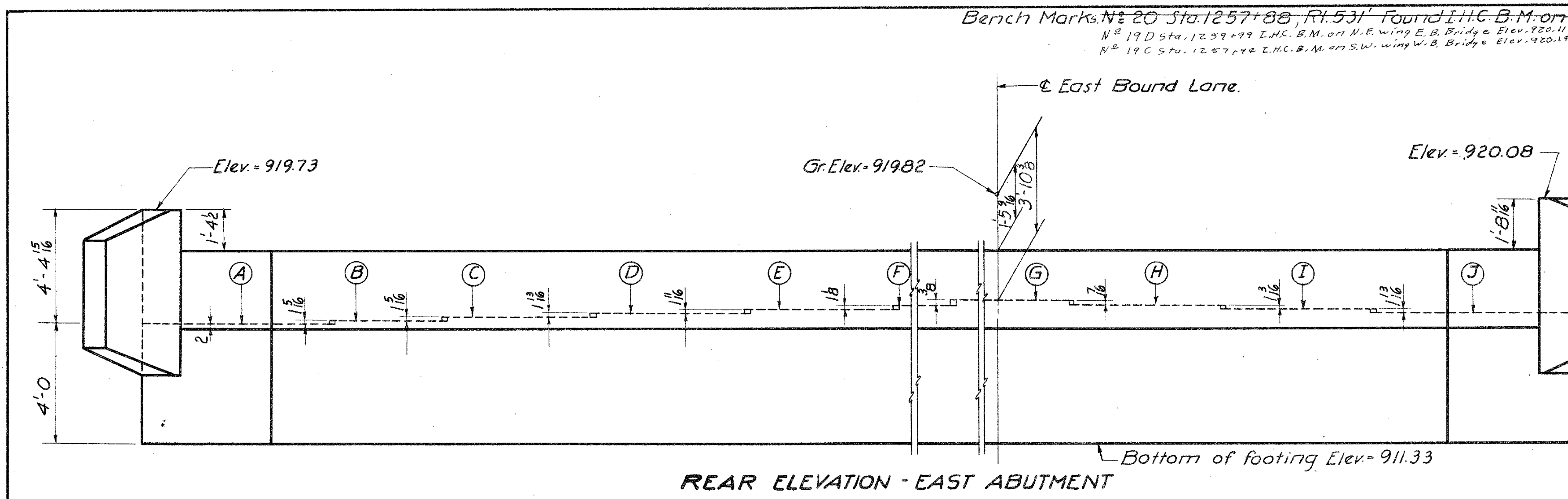
Weight of cap - 992

Formula used - $P = \frac{3WH}{S+0.35} \times \frac{W}{W+M}$ Vert.

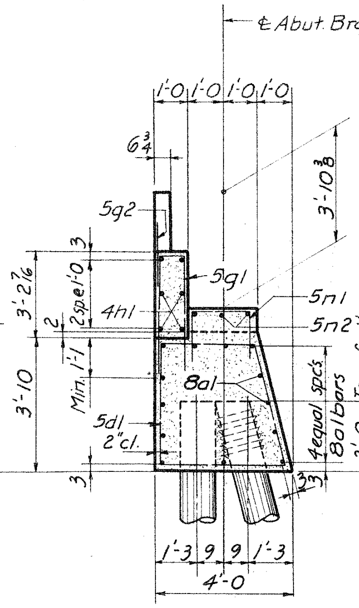
$$P = \frac{(3)(1.8)(10)}{S+0.35} \times \frac{3600}{5928}$$

$$P = \frac{54}{S+0.35} \times 0.6073$$

$$P = \frac{33.79}{S+0.35}$$

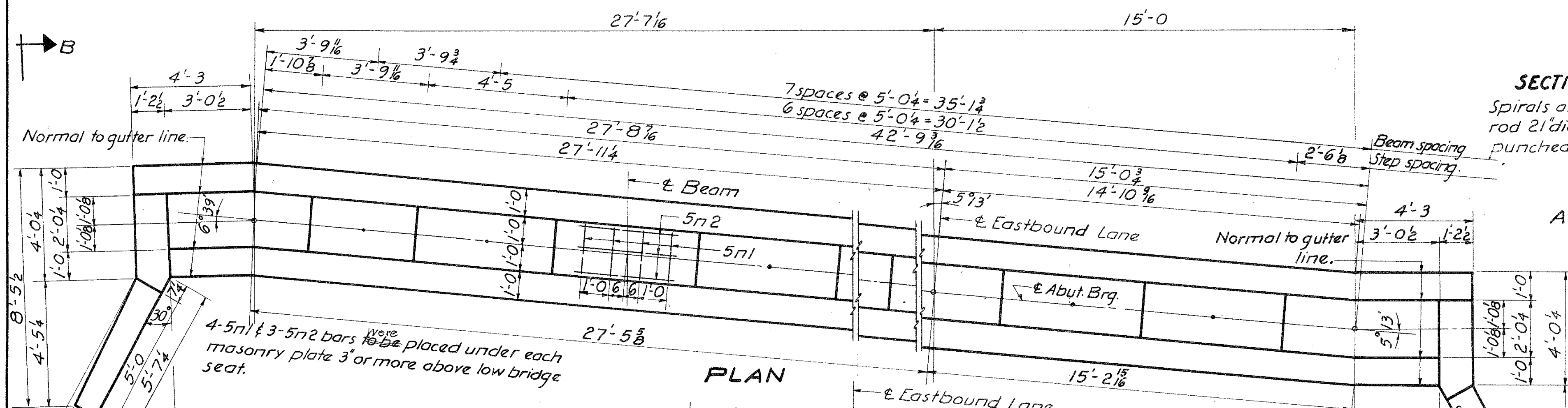


REAR ELEVATION - EAST ABUTMENT

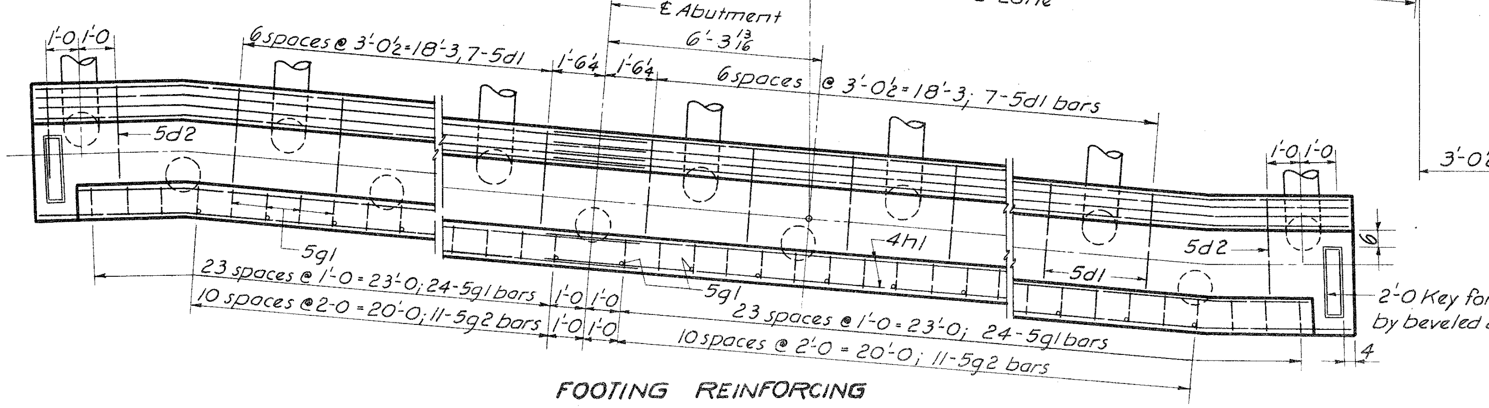


SECTION AT ℄ EAST BOUND LANE

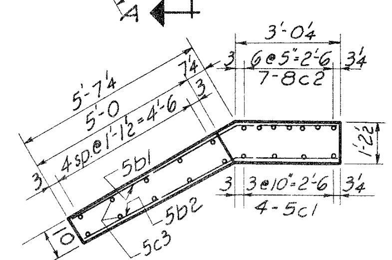
Spirals at top of each pile consist of 7 turns of ¼"⌀ rod 21" diameter 3" pitch with 2-⅞[0.69 spacers punched to hold spiral.

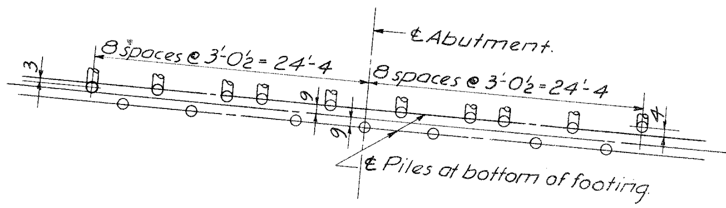


PLAN



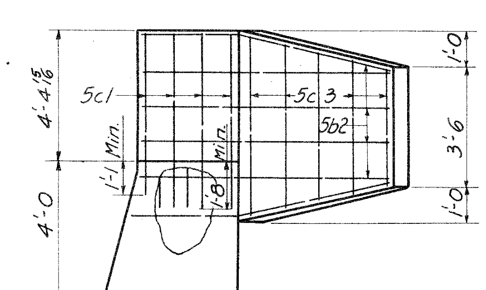
FOOTING REINFORCING



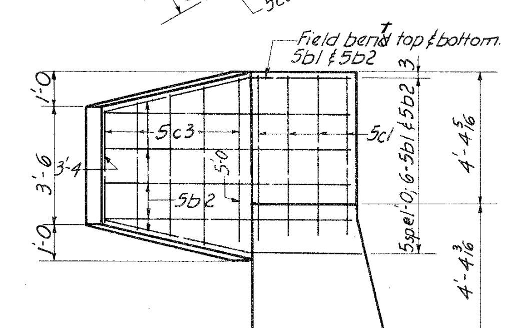


PILING LAYOUT

Note: 17 creosoted piles required. Battered front piles 1:4 as shown.



VIEW B-B

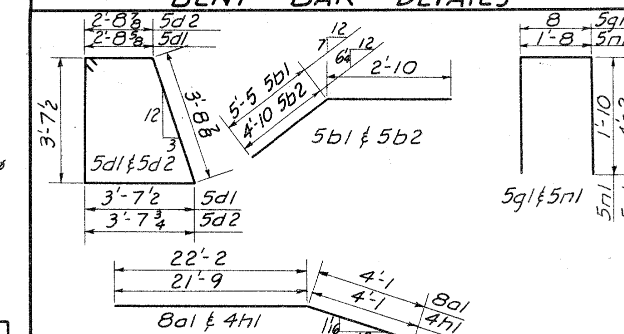


VIEW A-A

REINFORCING BAR LIST

Bar	Location	Shape	№	Length	Weight
8a1	Footing Longit.		26	26'-3	1822
5b1	Wing Horiz. B.F.		12	8'-3	103
5b2	" " F.F.		12	7'-8	96
5c1	" Vertical F.F.		8	5'-4	44
8c2	" " B.F.		14	5'-11	221
5c3	" " F.F. & B.F.		20	Varies	87
5d1	Footing Hoops		14	14'-5	211
5d2	" "		4	14'-6	60
5g1	Backwall Vertical		49	8'-10	451
*5g2	Paving Notch Dowels		22	2'-0	46
4h1	Backwall Horiz.		12	25'-10	207
5n1	Step Hoop		28	5'-2	151
5n2	" Longit.		21	3'-3	71
	Pile Spirals ¼"⌀ Rod		17	38'-6	109
	Pile Spacers ⅞[0.69		34	1'-10	43
*	See Abutment Notes.			Total	3722 lbs.

BENT BAR DETAILS



Note: All dimensions are out to out.

TABLE OF ELEVATIONS

Point	Elevation
A	915.33
B	915.44
C	915.55
D	915.70
E	915.84
F	915.93
G	915.96
H	915.92
I	915.82
J	915.67

CONCRETE PLACEMENT QUANTITIES

Item	Quantity
Footing (includes steps)	26.8 c.y.
Backwall	5.8 c.y.
Wings	2.9 c.y.
Paving Block	1.1 c.y.
Total	36.6 c.y. ✓

ESTIMATED QUANTITIES

Item	Quantity
Concrete	36.6 c.y. ✓
Reinforcing Steel	3722 lbs. ✓
Creosoted Piling 17 @ ~~40'~~ 35	595 ~~680~~ L.F.
Class 20 Excavation	103 c.y. ✓
Granular Backfill	84 tons ✓

ABUTMENT NOTES.

Before placing temporary paving block, ~~bend~~ bent all 5g2 bars and cover the top of the backwall with tar paper to prevent bond, 5g2 ~~are to be~~ were made of structural grade reinforcing steel.

All exposed corners 90° or sharper ~~are to be~~ were formed with a ¾" dressed and beveled fillet.

Minimum clear distance between face of concrete and near reinforcing bar ~~shall be~~ is 2" unless shown otherwise.

All piling ~~shall be~~ was driven to full penetration, if practicable, but to at least 20 ton bearing value, but no more than 40 ton maximum bearing value.

Masonry plates and beams ~~are to be~~ were set before backwall ~~is~~ was placed.

Reinforcing Steel ~~is to be~~ was securely wired in place before concrete is poured.

The Bridge Contractor ~~is to~~ backfilled behind abutments between wingwalls to subgrade elevation with granular backfill complying with Section 4133 of the Standard Specifications. See detail on sheets 2 and 3.

Design for 5°13' Skew

DUAL 211'-3×30' & VARIABLE ROADWAY PRETENSIONED PRESTRESSED CONCRETE BEAM BRIDGES

43'-1½ & 38'-11½ End Spans 2-64'-7 Interior Spans

Concrete Floor & Substructure Tubular Rail

EAST BOUND LANE - EAST ABUTMENT DETAILS

Station: 1258+95.48 E.B. Lane Project № FU-1065(10)

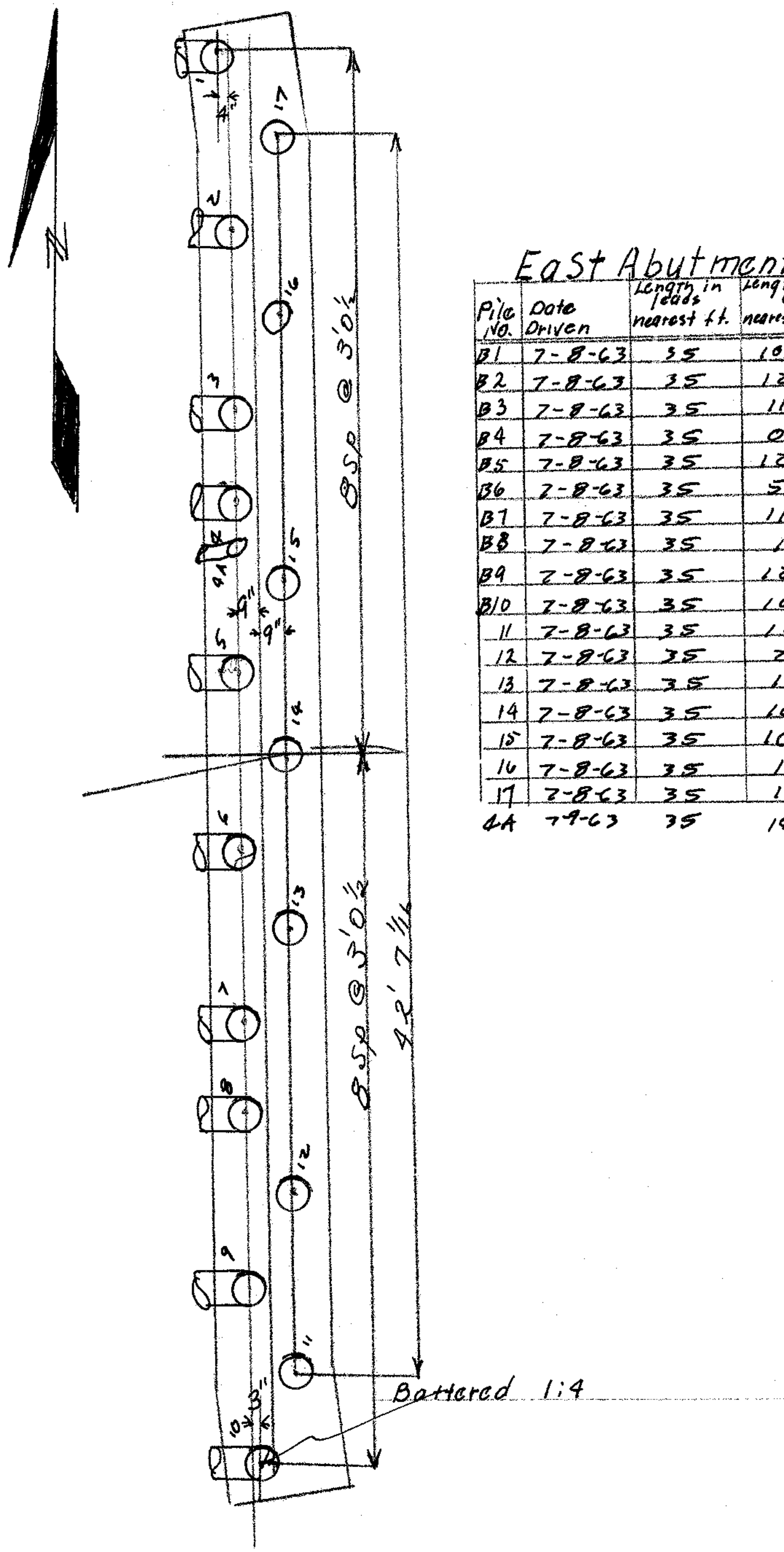
STORY COUNTY

Iowa State Highway Commission

September 1962 Sheet 4 of 23

Design № 3261 Story County File № 21508

Designed by: B.F. Traced by: [illegible] Checked by: R.D.U.



East Abutment East Bound Lane

Pile No.	Date Driven	Length in leads nearest ft.	Length cut off nearest .1 ft	Length in Structure	Ave. Pen. last 5 blows (inches)	Drop in feet	Bearing in tons
B1	7-8-63	35	10.3	24.7	R	10	—
B2	7-8-63	35	12.4	22.6	0.325	10	47.3
B3	7-8-63	35	11.3	23.7	0.425	10	41.2
B4	7-8-63	35	0.1	34.9	2.0	10	13.6
B5	7-8-63	35	12.1	22.9	0.425	10	41.2
B6	7-8-63	35	5.9	29.1	R	10	—
B7	7-8-63	35	11.7	23.3	0.35	10	45.6
B8	7-8-63	35	1.4	33.6	1.00	10	23.6
B9	7-8-63	35	12.7	22.3	0.425	10	41.2
B10	7-8-63	35	10.5	24.5	0.45	10	39.9
11	7-8-63	35	12.1	22.9	0.40	10	45.0
12	7-8-63	35	2.2	32.8	0.45	10	42.2
13	7-8-63	35	1.2	33.8	1.20	10	21.8
14	7-8-63	35	10.4	24.6	0.375	10	46.6
15	7-8-63	35	10.9	24.1	0.35	10	48.3
16	7-8-63	35	1.9	33.1	0.45	10	42.2
17	7-8-63	35	1.3	33.7	0.70	10	32.2
4A	7-9-63	35	14.3	20.7	0.30	10	52.0

35 ft. Piles

Type hammer - Gravity
Gross Weight - 3643
weight of pile - 1336
I.H.C. hammer № - 749
Effective weight - 3600
I.H.C. cap № - 788
weight of cap - 992

Formula used - $P = \frac{3WH}{S+0.35} \times \frac{W}{W+M}$ Vert.

$$P = \frac{(3)(1.8)(10)}{S+0.35} \times \frac{3600}{5928}$$

$$P = \frac{54}{S+0.35} \times 0.6073$$

$$P = \frac{33.79}{S+0.35} \text{ Vert.}$$

(") 0.996 Batt. 1:4

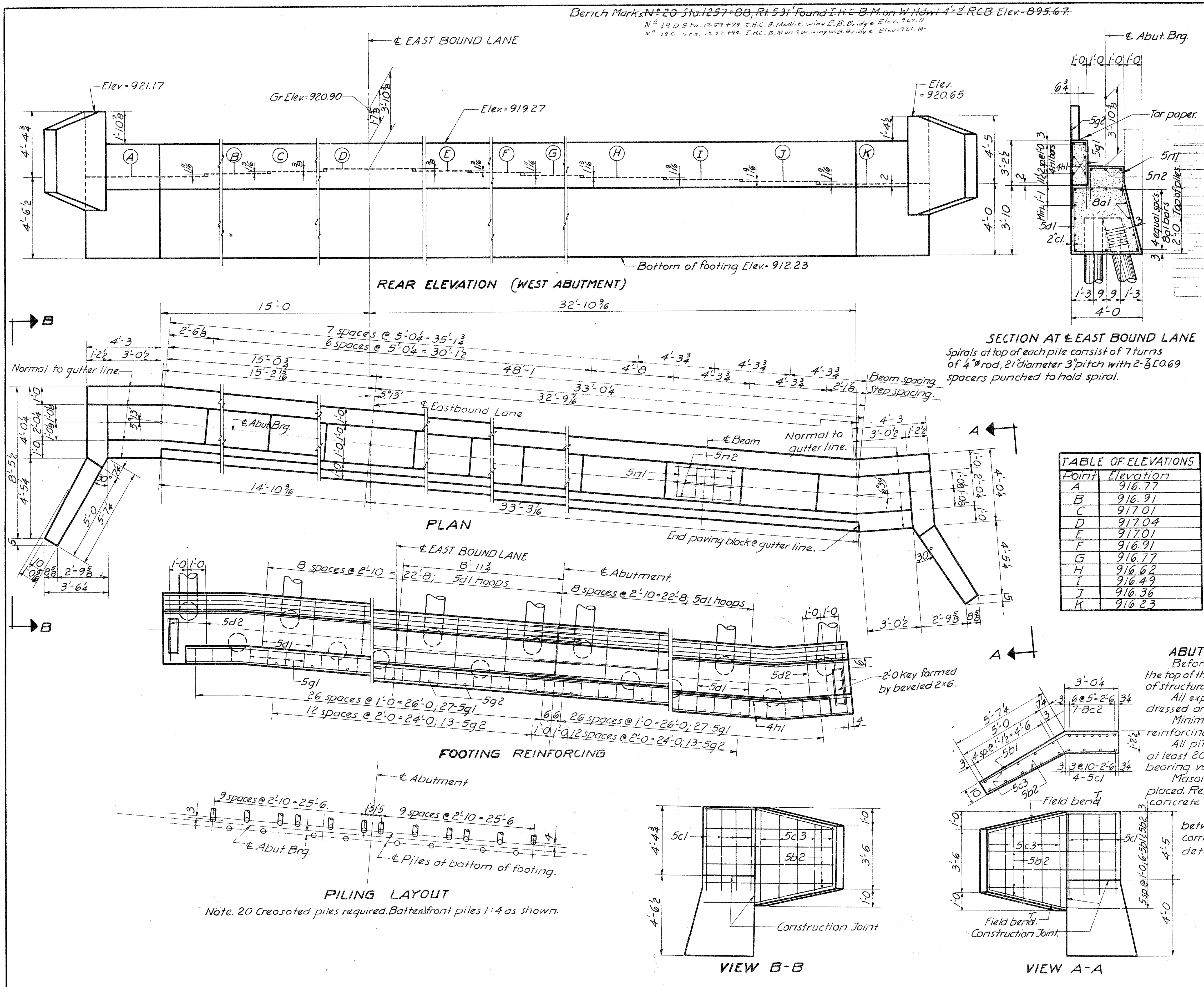


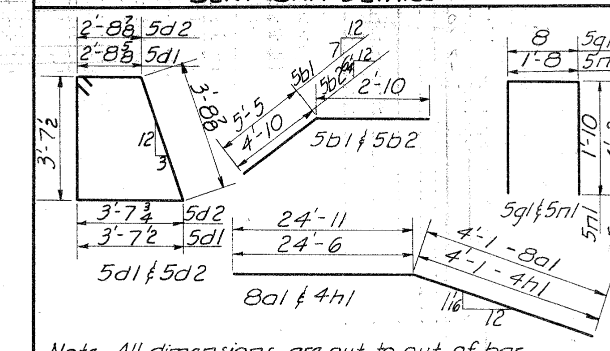
TABLE OF ELEVATIONS

Point	Elevation
A	916.77
B	916.91
C	917.01
D	917.04
E	917.01
F	916.91
G	916.77
H	916.62
I	916.49
J	916.36
K	916.23

REINFORCING BAR LIST

Bar	Location	Shape	Nº	Length	Weight
8a1	Footing Longit.		26	29'-0	2013
5b1	Wing Horiz. B.F.		12	8'-3	103
5b2	" " F.F.		12	7'-8	96
5c1	" Vert. F.F.		8	5'-6	46
8c2	" " B.F.		14	6'-1	227
5c3	" " F.F. & B.F.		20	Varies	87
5d1	Footing Hoops		17	14'-5	256
5d2	" " (Ends only.)		4	14'-6	60
5g1	Backwall Vert.		54	8'-10	497
*5g2	~~Paving~~ Notch Dowels		26	2'-0	54
4h1	Backwall Horiz.		12	28'-7	229
5n1	Step Hoop		36	5'-2	194
5n2	Step Longit.		27	3'-3	92
	Pile Spirals 1/4"ø Rod		20	38'-6	129
	Pile Spacers 7/8 [0.69		40	1'-10	51
*	See Abutment Notes.			Total	4134 lbs

BENT BAR DETAILS



Note: All dimensions are out to out of bar.

CONCRETE PAVEMENT QUANTITIES

Item	Quantity
Footing (Includes Steps)	30.0 c.y.
Backwall	6.4 "
Wings	3.0 "
Paving Block	1.4 "
Total	40.8 c.y.

ESTIMATED QUANTITIES

Item	Quantity
Concrete	40.8 c.y.
Reinforcing Steel	4134 lbs.
Creosoted Piling 20 @ ~~45'~~ 35'	~~900~~ 700 L.F.
Class 20 Excavation	113 c.y.
Granular Backfill	93 tons

ABUTMENT NOTES.

Before placing temporary paving block, ~~bend~~ bent all 5g2 bars and covered the top of the backwall with tar paper to prevent bond, 5g2 ~~are to be~~ were made of structural grade reinforcing steel.

All exposed corners of 90° or sharper ~~are to be~~ were formed with a 3/4" dressed and beveled fillet.

Minimum clear distance between face of concrete and near reinforcing bar ~~shall be~~ is 2" unless shown otherwise.

All piling ~~shall be~~ were driven to full penetration if practicable but to at least 20 ton bearing value, but no more than 40 ton maximum bearing value.

Masonry plates and beams ~~are to be~~ were set before backwall ~~is~~ was placed. Reinforcing Steel ~~is to be~~ was securely wired in place before concrete ~~is~~ was poured.

The Bridge Contractor ~~is to~~ backfilled behind abutments between wingwalls to subgrade elevation with granular backfill complying with Section 4133 of the Standard Specifications. See detail on sheets 2 and 3.

Design for 5°13' Skew

DUAL 211'-3 × 30' & VARIABLE ROADWAY PRETENSIONED PRESTRESSED CONCRETE BEAM BRIDGES

43'-1½ & 38'-11½ End Spans 2-64'-7 Interior Spans

Concrete Floor & Substructure Tubular Rail

EAST BOUND LANE - WEST ABUTMENT DETAILS

Station 1258+95.48 E.B. Lane Project Nº FU-1065(10)

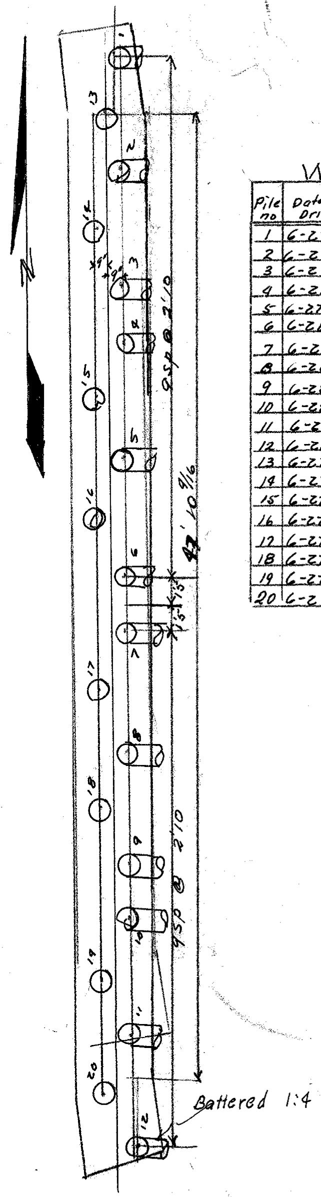
STORY COUNTY

Iowa State Highway Commission

September 1962 Sheet 5 of 23

Design Nº 3261 Story County File Nº 21508

Designed by: B.F. Traced by: F.G. Checked by: R.D.W.



West Abutment East Bound Lane

Pile no	Date Driven	Length in leads Nearest ft.	Length cut off nearest .1 ft	Length in Structure	Ave Pen last 5 blows (inches)	Drop in feet	Bearing in tons
1	6-27-63	35	0.5	34.5	1.25	10	19.9
2	6-27-63	35	5.2	29.8	R	5	–
3	6-27-63	35	4.1	30.9	0.375	10	44.1
4	6-27-63	35	13.6	21.4	0.90	10	42.6
5	6-27-63	35	11.7	23.3	0.35	10	45.6
6	6-28-63	35	13.9	21.1	R	10	–
7	6-28-63	35	13.4	21.6	R	10	–
8	6-28-63	35	14.1	20.9	0.30	10	49.2
9	6-28-63	35	15.5	19.5	0.375	10	44.1
10	6-28-63	35	14.3	20.7	R	10	–
11	6-28-63	35	2.9	32.1	0.60	10	33.6
12	6-28-63	35	7.5	27.5	R	10	–
13	6-27-63	35	13.2	21.8	R	10	–
14	6-27-63	35	11.5	23.5	R	10	–
15	6-27-63	35	1.2	33.8	0.50	10	39.7
16	6-27-63	35	14.5	20.5	R	10	–
17	6-27-63	35	1.1	33.9	0.85	10	28.1
18	6-27-63	35	5.3	29.7	0.30	10	52.0
19	6-27-63	35	5.0	30.0	0.30	10	52.0
20	6-27-63	35	3.1	31.9	0.40	10	45.0

35 ft. Piles
Type hammer - Gravity
Gross Weight - 3643
weight of pile - 1336
I.H.C. hammer No - 749
Effective weight - 3600
I.H.C. cap No - 788
Weight of cap - 992
Formula used - $P = \frac{3WH}{S+0.35} \times \frac{W}{W+M}$ Vert.

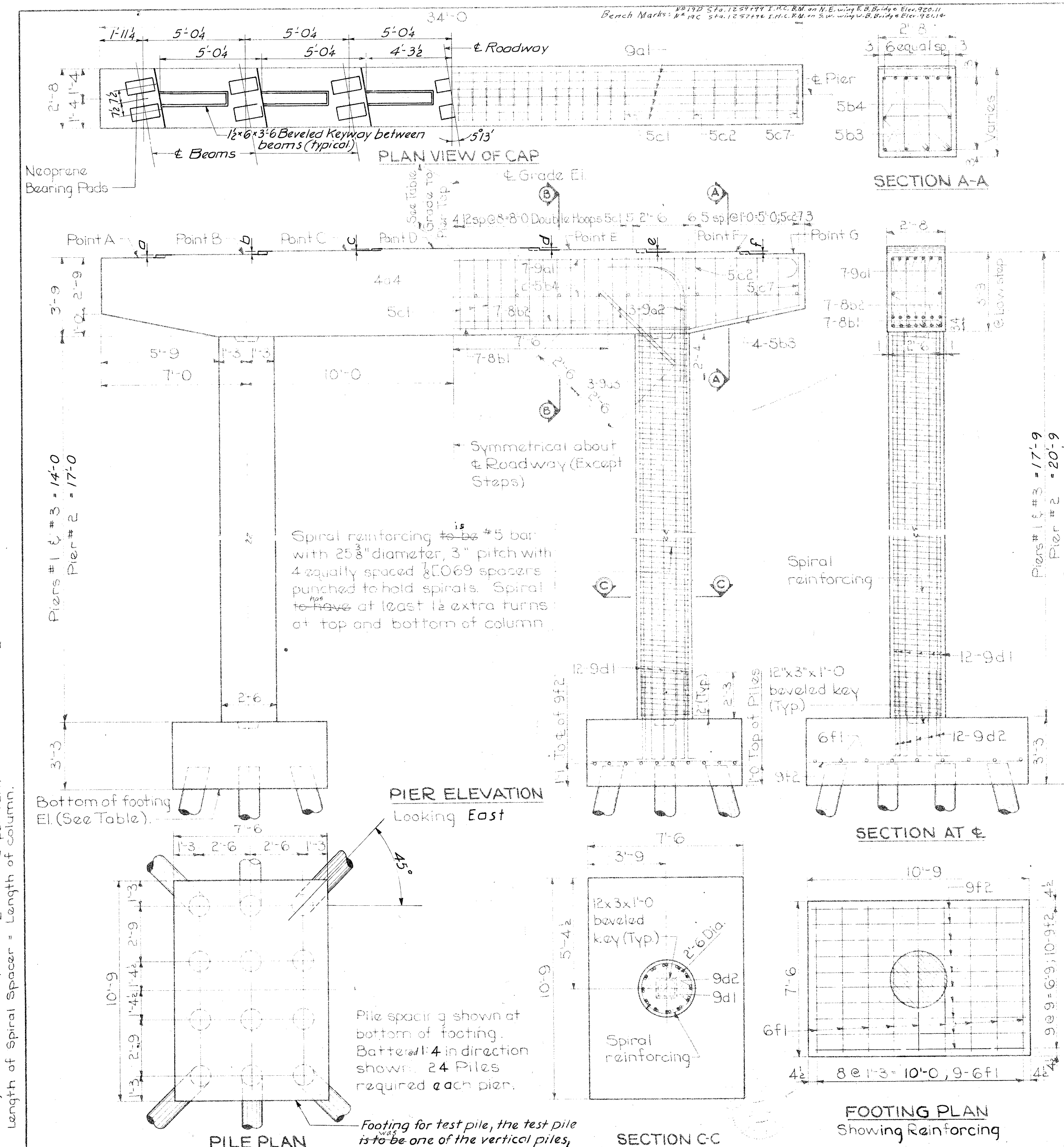
$$P = \frac{(3)(1.8)(10)}{S+0.35} \times \frac{3600}{5928}$$

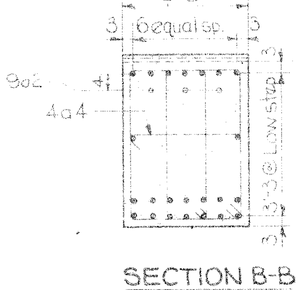
$$P = \frac{54}{S+0.35} \times 0.6073$$

$$P = \frac{33.79}{S+0.35}$$

Bench Marks: Nº 19D Sta. 1259+94 I.H.C. B.M. on N. Ewing E.B. Bridge Elev. 920.11; Nº 19C Sta. 1257+96 I.H.C. B.M. on S.W. wing W.B. Bridge Elev. 921.14

~~Bench Mark Nº 20 Sta 1257+88, 531' Rt Found I.H.C. B.M. on W. Hdwl 4'×2' R.C.B. Elev. = 895.67~~





REINFORCING STEEL - ONE PIER

Bar	Location	Shape	Nº	Length	Pier #1 Weight	Pier #2 Weight	Pier #3 Weight
9a1	Beam Top-Longit.		7	36'-2	861	861	861
9a2	Beam Corner		6	8'-5	172	172	172
9a3	Beam Corner		6	5'-0	102	102	102
4a4	Beam Transverse		16	2'-10	30	30	30
8b1	Beam Bottom-Longit.		7	22'-6	421	421	421
8b2	Beam Bottom-Longit.		7	15'-0	280	280	280
5b3	Cantilever Bottom		8	7'-8	64	64	64
5b4	Beam Sides		2	33'-8	70	70	70
5c1	Beam Hoops		52 ~~26~~	10'-10	588 ~~294~~	588 ~~294~~	~~294~~ 588
5c2-7	Beam Hoops - Ends		24 ~~12~~	Varies	~~123~~ 246	~~123~~ 246	~~123~~ 246
9d1	Column Vert - Pier #1 & #3		24	17'-5	1421	—	1421
9d1	Column Vert - Pier #2		24	20'-5	—	1666	—
9d2	Column Dowels		24	4'-7	374	374	374
6f1	Footing Bottom, Trans.		18	7'-2	194	194	194
9f2	Footing Bottom, Longit.		20	10'-5	708	708	708
	Column Spiral - Pier #1 & #3 *		2	383'-8	800	—	800
	Column Spiral - Pier #2 *		2	463'-5	—	967	—
⅞[1.069	Spiral Spacer - Pier #1 & #3		8	14'-0	77	—	77
⅞[1.069	Spiral Spacer - Pier #2		8	17'-0	—	94	—
					6408	6837	6408
* See Pier Notes Below				Total (lbs.)	~~5991~~	~~6420~~	~~5991~~

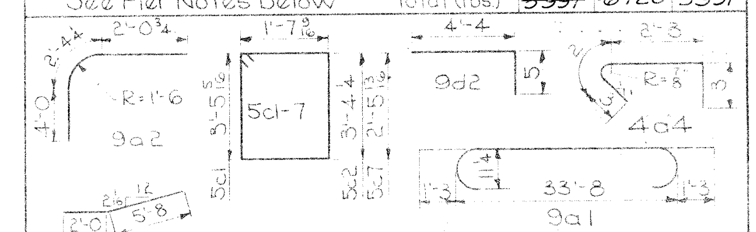


TABLE OF ELEVATIONS

Point	Pier #1	Pier #2	Pier #3
A	916.67	916.40	915.96
B	916.82	916.55	916.11
C	916.92	916.64	916.21
D	916.95	916.68	916.25
E	916.92	916.65	916.22
F	916.83	916.56	916.13
G	916.68	916.41	915.99
℄ Grade El.	920.80	920.52	920.09
Bott. of Ftg.	895.67	892.40	894.96
Grade To Pier Top	3'-10 3/16	3'-10 3/16	3'-10 3/16

TABLE OF PIER STEPS

	Pier #1	Pier #2	Pier #3
a	1 3/4	1 3/4	1 13/16
b	1 1/8	1 1/8	1 13/16
c	3/8	3/8	7/16
d	3/8	3/8	5/16
e	1 1/8	1 1/8	1 1/16
f	1 3/4	1 3/4	1 11/16

PIER NOTES:

All exposed corners of 90° or sharper ~~are to be~~ were formed with a ¾" dressed and beveled fillet.

Clear distance from face of concrete to near reinforcing bar ~~shall be~~ 2" unless otherwise shown or noted.

Piles ~~are to be~~ driven to full penetration where practicable, but to at least a 20 ton minimum, but no more than 40 ton maximum.

The spiral reinforcing ~~may be~~ made of plain structural grade reinforcing steel and spliced by lapping 1½ turns. The length of spiral shown does not include the lapped length of the splices. The cost of laps at splices ~~is to be~~ were included in the price bid for other reinforcement.

CONCRETE PLACEMENT QUANT.

Location	Pier #1	Pier #2	Pier #3
Pier Cap	12.6	12.6	12.6
Pier Columns	5.1	6.2	5.1
Footing	18.9	18.9	18.9
Total (cu.yd.)	36.6	37.7	36.6

ESTIMATED QUANTITIES

Item	Unit	Pier #1	Pier #2	Pier #3	Total
Concrete	c.y.	36.6	37.7	36.6	110.9
Reinforcing Steel	lb.	6408 ~~5991~~	6837 ~~6420~~	6408 ~~5991~~	~~18402~~ 19653
Creosoted Piling	L.F.	23 @ ~~30'~~ 16	24 @ ~~30'~~ 16	24 @ ~~30'~~ 16	~~2130~~ 1136
Class 20 Excavation	c.y.	56	54	56	166
Creosoted Test Pile	L.S.	1 @ 30'	—	—	Lump Sum

Design for 5°13' Skew

DUAL 211'-3×30'℄ VAR. RDWY. PRETENSIONED PRESTRESSED CONCRETE BEAM BRIDGES

43'-1½ & 38'-11½ End Spans 2-64'-7 Interior Spans

Concrete Floor & Substructure Tubular Rail

WEST BOUND LANE - PIER DETAILS

Station 1259+02.23 W.B. Lane Project Nº FU-1065(10)

STORY COUNTY

IOWA STATE HIGHWAY COMMISSION

September 1962 Sheet 6 of 23

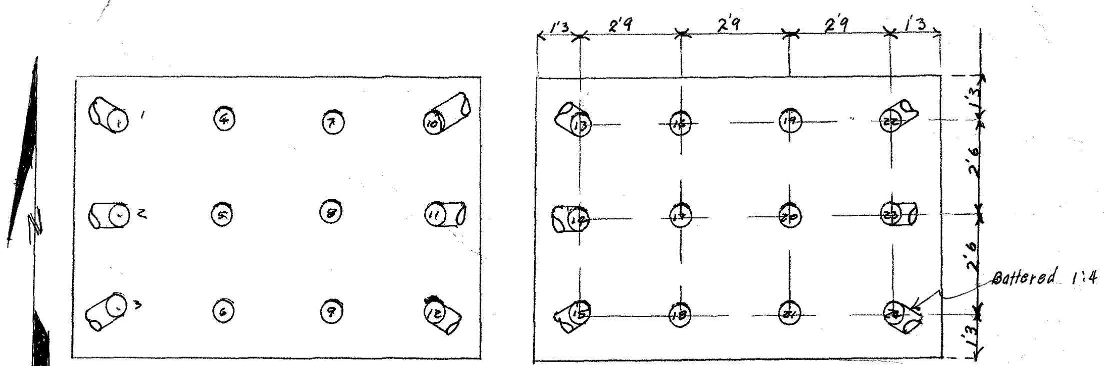
Design Nº 3261 Story County File Nº 21508

Designed by: B.F. Traced by: G Checked by: RDL

Revised 6-10-63: Number & weights of bars 5c1 and 5c2-7 corrected.

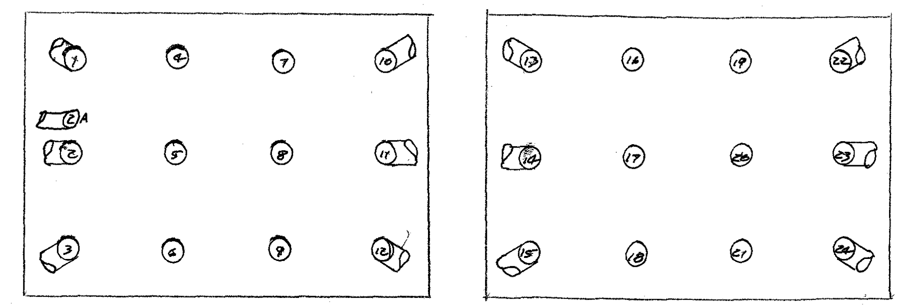
OFFICE NOTE: This Standard Sheet is good for skews 0°00' - 7°30'. Design span lengths: Ext. 47'-3½, Int. 68'-9; Design pier heights: Int. 27'-0, Ext. 23'-0

Concrete Quantities:
Pier Cap = 324.70 ft³ + steps;
2 Pier Columns = 0.3636 cy per foot of column height.
Variable Reinforcing Bars:
Length of 9d1 = Pier Height - (3'-7).
Length of Column Spiral = [Column length in inches - 4 / 3 per turn + 3 turns] @ 6.652' per turn.
Length of Spiral Spacer = Length of column.



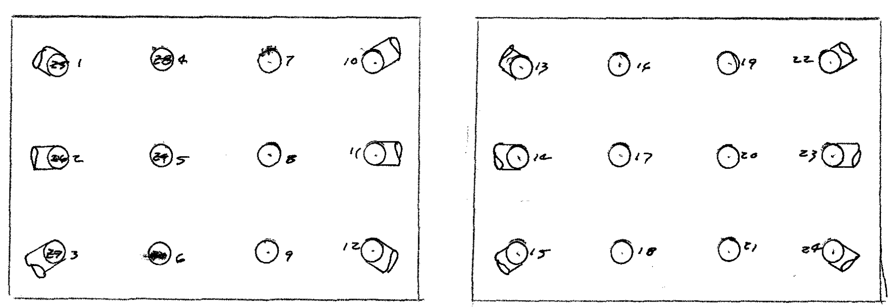
Pier No 1 West Bound Lane

Pile no.	Date Driven	Length in leads nearest ft.	Length cut off nearest .1 ft	Length in Structure	Ave. Pen last 5 blows (inches)	Drop in feet	Bearing in tons
B1	7-11-63	16	5.5	10.5	SR	5	—
B2	7-11-63	16	7.2	8.8	0.20	5	31.4
B3	7-11-63	16	5.0	11.0	R	5	—
4	7-11-63	16	8.2	7.8	R	5	—
5	4-26-63	30	20	10	1.01	8	20
6	7-11-63	16	8.6	7.4	R	5	—
7	7-11-63	16	4.9	11.1	R	5	—
8	4-26-63			16	test pile		71.4
9	7-11-63	16	8.0	8.0	0.50	5	22.8
B10	7-11-63	16	7.8	8.2	0.50	5	21.6
B11	7-11-63	16	6.6	9.4	0.20	5	31.4
B12	7-11-63	16	6.5	9.5	0.275	5	29.3
B13	7-10-63	16	1.5	14.5	0.20	5	31.4
B14	7-11-63	16	3.8	12.2	0.20	5	31.4
B15	7-11-63	16	6.7	9.3	0.45	5	22.9
16	7-10-63	16	2.0	14.0	0.225	5	33.6
17	7-10-63	16	7.7	8.3	R	5	—
18	7-10-63	16	10.0	6.0	0.50	5	22.8
19	7-10-63	16	5.8	10.2	0.225	5	33.6
20	7-10-63	16	8.3	7.7	0.225	5	33.6
21	7-10-63	16	4.9	11.1	0.50	5	22.8
B22	7-10-63	16	6.9	9.1	0.40	5	24.4
B23	7-10-63	16	7.1	8.9	0.40	5	24.4
B24	7-10-63	16	4.8	11.2	0.50	5	21.6 ~~22.8~~



Pier No 2 West Bound Lane

Pile no.	Date Driven	Length in leads nearest ft.	Length cut off nearest .1 ft	Length in Structure	Ave. Pen. last 5 blows (inches)	Drop in feet	Bearing in Tons
B1	6-3-63	16	3.0	13.0	0.55	10	40.7
B2	6-3-63	16	2.7	8.3	brake		
B3	6-4-63	16	8.5	7.5	—	6	R
4	6-3-63	16	0.7	15.3	0.65	10	38.6
5	6-3-63	16	1.2	14.8	0.65	10	38.6
6	6-3-63	16	3.3	12.7	0.55	10	43.0
7	6-3-63	16	1.6	14.4	0.70	10	36.8
8	6-3-63	16	2.8	13.2	0.70	10	36.8
9	6-3-63	16	1.9	14.1	0.60	10	40.7
B10	6-4-63	16	4.5	11.5	0.60	10	38.5
B11	6-4-63	16	1.1	14.9	0.85	10	30.4
B12	6-4-63	16	1.4	14.6	0.95	10	28.1
B13	6-3-63	16	8.2	7.8	—	~~R~~	—R
B14	6-3-63	16	7.4	8.6	—	10	R
B15	6-3-63	16	6.2	9.8	—	~~B~~5	R
16	6-3-63	16	6.0	10.0	—	7	R
17	6-3-63	16	7.2	8.8	0.50	10	45.5
18	6-3-63	16	1.6	14.4	0.75	10	35.1
19	6-3-63	16	1.0	15.0	0.80	10	31.8
20	6-3-63	16	1.1	14.9	0.50	10	45.5
21	6-3-63	16	4.2	11.8	—	8	R
B22	6-3-63	16	3.1	12.9	0.70	10	34.8
B23	6-3-63	16	0.6	15.4	0.90	10	29.2
B24	6-3-63	16	5.3 ~~1.2~~	10.7 ~~14.8~~	~~0.60~~	8 ~~10~~	R
B2A	6-3-63	16	1.2	14.8	0.60	10	38.5



Pier No 3 West Bound Lane

Pile no.	Date Driven	Length in leads nearest ft.	Length cut off nearest .1 ft.	Length in Structure	Ave. Pen last 5 blows (inches)	Drop in feet	Bearing in tons.
B1	6-12-63	16	7.3	8.7	R	6	—
B2	6-12-63	16	5.4	10.6	0.45	5	29.2
B3	6-12-63	16	8.7	7.3	R	5	—
4	6-12-63	16	3.9	12.1	R	10	—
5	6-12-63	16	1.6	14.4	0.70	10	36.8
6	6-12-63	16	1.2	14.8	1.10	10	26.6
7	6-12-63	16	1.8	14.2	0.80	10	33.5
8	6-12-63	16	1.6	14.4	1.05	10	27.6
9	6-12-63	16	1.4	14.6	1.00	10	28.6
B10	6-12-63	16	9.2	6.8	R	6	—
B11	6-12-63	16	9.5	6.5	1.0	10	27.0
B12	6-12-63	16	1.3	14.7	0.85	10	30.4
B13	6-12-63	16	8.2	7.8	1.0	10	27.0
B14	6-12-63	16	7.9	8.1	R	10	—
B15	6-12-63	16	8.4	7.6	1.0	10	27.0
16	6-12-63	16	1.5	14.5	0.95	10	27.7
17	6-12-63	16	2.3	13.7	1.0	10	28.6
18	6-12-63	16	1.9	14.1	1.10	10	26.6
19	6-12-63	16	5.2	10.8	R	8	—
20	6-12-63	16	2.5	13.5	0.70	10	36.8
21	6-12-63	16	1.2	14.8	1.00	10	28.6
B22	6-12-63	16	2.1	13.9	1.00	10	27.0
B23	6-12-63	16	9.1	6.9	1.20	10	23.6
B24	6-12-63	16	2.0	14.0	0.85	10	30.4

16 ft. Piles
Type hammer - Gravity
Gross weight - 3643
Weight of pile - 440
I.H.C. hammer No. - 749
Effective weight - 3600
I.H.C. cap No. - 788
Weight of cap - 992

Formula used - $P = \frac{3wH}{s+0.35} \times \frac{w}{w+m}$ Vert.

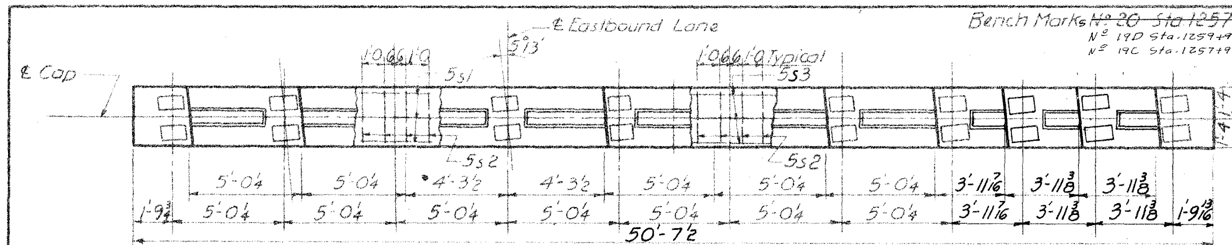
$P = \frac{(3)(18)(10)}{s+0.35} \times \frac{3600}{5032}$

$P = \frac{54}{s+0.35} \times 0.7154$

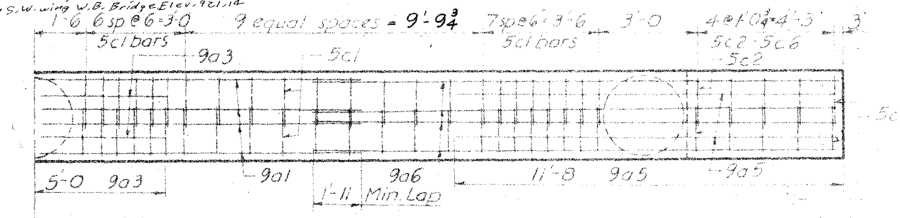
$P = \frac{38.63}{s+0.35}$ Vert.

(") 0.946 Batt. 1:4

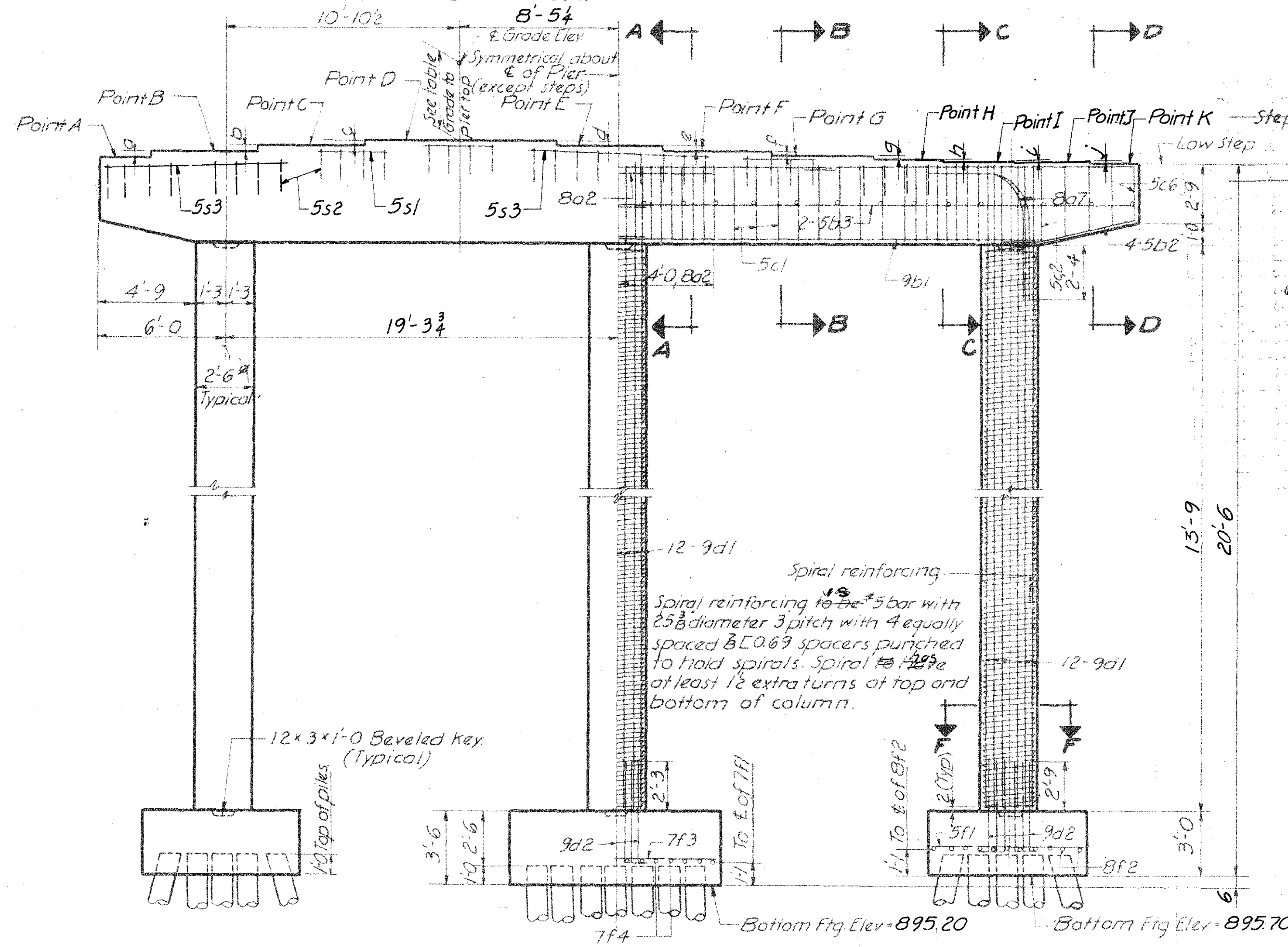
Bench Marks: ~~Nº 20 Sta. 1257+88, 53' Rt. Found I.H.C. B.M. on W. Hdwl. 4×2 RCB Elev. 895.6?~~
Nº 19D Sta. 1259+44 I.H.C. B.M. on N.E. wing E.B. Bridge Elev. 921.11
Nº 19C Sta. 1257+74 I.H.C. B.M. on S.W. wing W.B. Bridge Elev. 921.14



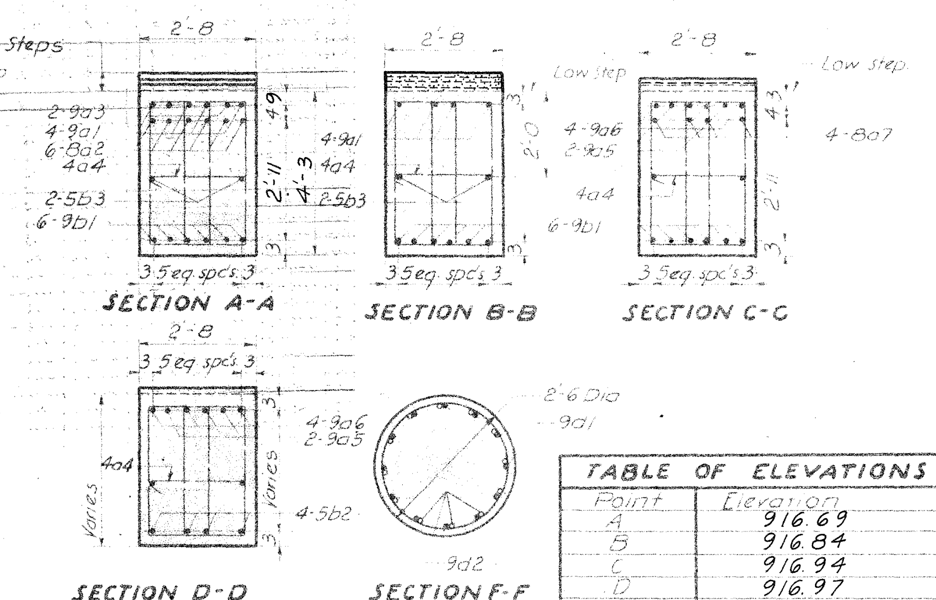
PLAN VIEW OF CAP



PLAN VIEW (Showing Reinforcement)



PIER ELEVATION
(Looking East)

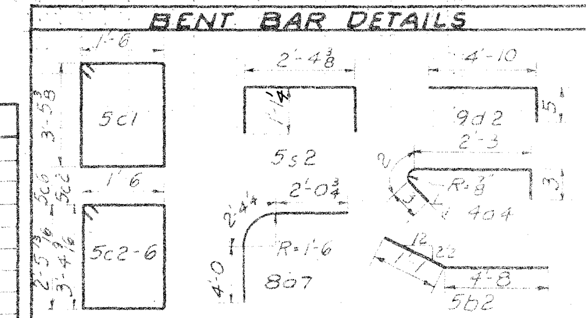


SECTION A-A SECTION B-B SECTION C-C

SECTION D-D SECTION F-F

REINFORCING BAR LIST - ONE PIER					
Bar	Location	Shape	Nº	Length	Weight
9a1	Beam Longit. Top		4	20'-0	272
8a2	" " "		6	8'-0	128
9a3	" " "		2	10'-0	68
4a4	Beam Transverse		26	2'-10	49
9a5	Beam Longit. Top		4	11'-6	156
9a6	" " "		8	17'-1	465
8a7	" Corner		8	8'-5	180
9b1	Beam Horiz. Bottom		12	21'-1	860
5b2	Cantilever "		8	5'-9	48
5b3	Beam Intermediate		4	25'-9	107
5c1	Beam Hoops		92	10'-7	1016
5c2-6	" " Ends		20	Varies	200
9d1	Column Vert		36	17'-2	2101
9d2	" Dowels		36	5'-1	622
5f1	Footing Bott. Transv.		34 ~~24~~	7'-2	~~1??~~ 254
8f2	" Longit.		32 ~~22~~	9'-0	~~529~~ 769
7f3	" Transverse		17 ~~13~~	9'-8	~~257~~ 336
7f4	" Longit.		18 ~~14~~	9'-0	~~258~~ 331
5s1	Bridge Seat Longit.		12	3'-6	44
5s2	" " Transv.		32	4'-5	147
5s3	" " Longit.		6	8'-6	53
	Column Spiral		3	377'-0	1180
	1⅜ E0.69 Spiral Spacer		12	13'-9	114
				Total lbs	9500 ~~9048~~

BENT BAR DETAILS



Note: All dimensions are out to out. Radii to ℄ of bar.

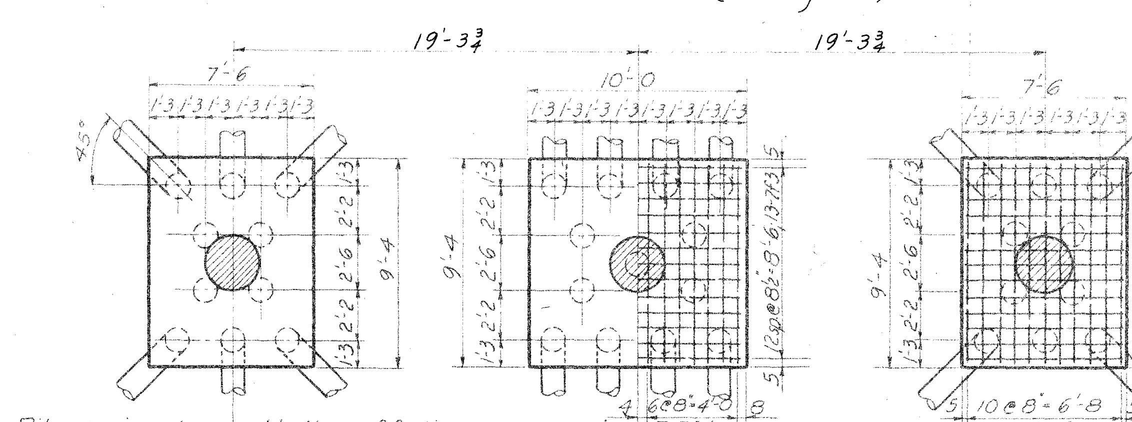
TABLE OF ELEVATIONS	
Point	Elevation
A	916.69
B	916.84
C	916.94
D	916.97
E	916.94
F	916.85
G	916.70
H	916.55
I	916.43
J	916.32
K	916.20
℄ Grade Elev	920.82
Gr. to Pier Top	3'-10 3/16

TABLE OF PIER STEPS	
a	1 13/16
b	1 3/16
c	3/8
d	3/8
e	1 1/8
f	1 1/16
g	1 13/16
h	1 7/16
i	1 3/8
j	1 7/16

CONCRETE PLACEMENT QUANTITIES	
Location	Quantity
Pier Cap (Includes Steps)	21.0 c.y.
Pier Columns	7.5 c.y.
Footing	32.9 ~~26.7~~ c.y.
Total	61.4 ~~55.2~~ c.y.

ESTIMATED QUANTITIES		
Item	Unit	Quantity
Concrete	c.y.	~~55.2~~ 61.4
Reinforcing Steel	lbs.	~~9048~~ 9500
*Creosoted Piling 33 @ 16' ~~30'~~	L.F.	584 ~~990~~ ~~1102~~
Class 20 Excavation	c.y.	71

*7 @ 8' ~~16'~~ added.



Pile spacing shown at bottom of footing.
Batter perimeter piles 1:4 in direction shown.
33 piles required.

FOOTING PLAN

NOTE: ℄ of pier is 8'-5¼ to right of ℄ of Eastbound Lane.

PIER NOTES.

All exposed corners of 90° or sharper ~~are to be~~ were formed with a ¾" dressed and beveled fillet.
Clear distance from face of concrete to near reinforcing bar ~~shall be~~ is 2" unless otherwise shown or noted.
Piles ~~are to be~~ are driven to full penetration if practicable, but in no case to less than 20 ton bearing capacity, but no more than 40 ton bearing value.
The spiral reinforcing ~~may be~~ was spliced by lapping 1½ turns. The length of spiral shown ~~does~~ did not include the lapped length of splices. The cost of laps at splices ~~is to be~~ was included in the price bid for other reinforcement. The spiral reinforcement ~~may be~~ was made of plain structural grade reinforcing steel.

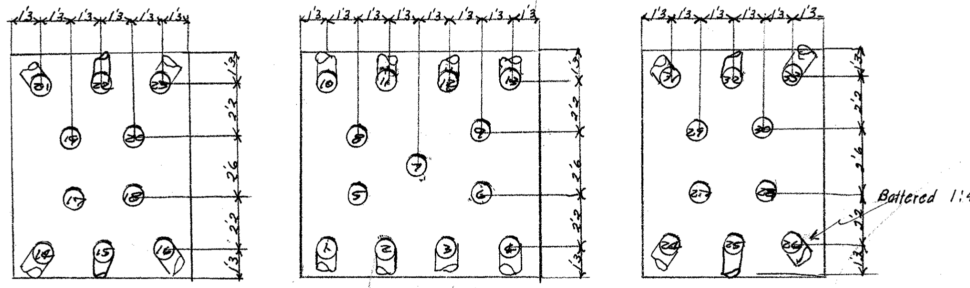
SPECIFICATIONS.

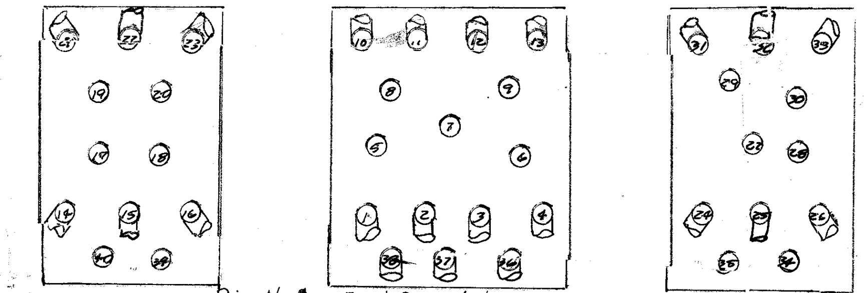
Design: A.A.S.H.O. Series of 1961.
Construction: Standard Specifications of the Iowa State Highway Commission, Series of 1960, plus current supplemental specifications and special provisions.

Design for 5°13' Skew
DUAL 211'-3 × 30' & VAR. RDWY. PRETENSIONED PRESTRESSED CONCRETE BEAM BRIDGES
43'-1½ & 38'-11½ End Spans - 2-64'-7 Interior Spans
Concrete Floor & Substructure Tubular Rail
EAST BOUND LANE - PIER Nº 1 DETAILS
Station 1258+95.48 Project Nº FU-1065(10)
STORY COUNTY
Iowa State Highway Commission
September 1962 Sheet 7 of 23
Design Nº 3261 Story County File Nº 21508

Designed by: B.F. Traced by: F.J. Checked by: R.D.U.

Revised 7-22-63: Sheet 7a of 23 added for corrected footing layout, quantities changed.



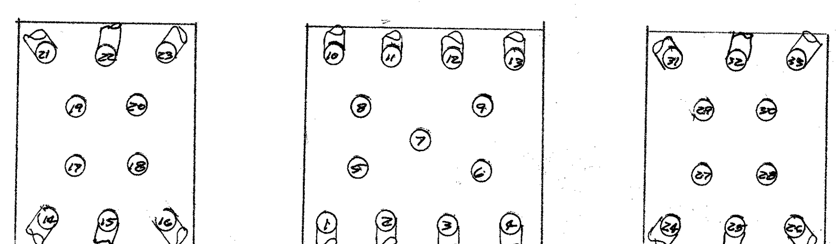


Pier No. 2 East Bound Lane

Pile no.	Date Driven	Length in leads nearest ft	Length cut off nearest .1 ft	Length in Structure	Ave. Pen. last 5 blows (inches)	Drop in feet	Bearing in tons
B1	6-6-63	16	1.3	14.7	0.60	10	38.5
B2	6-5-63	16	3.0	13.0	0.70	10	34.8
B3	6-5-63	16	1.4	14.6	0.65	10	36.5
B4	6-5-63	16	1.1	14.9	0.45	10	45.7
5	6-5-63	16	3.3	12.7	1.20	10	24.9
6	6-5-63	16	1.4	14.6	1.10	10	26.6
7	6-5-63	16	1.1	14.9	1.25	10	24.2
8	6-5-63	16	1.5	14.5	1.30	10	23.4
9	6-5-63	16	0.7	15.3	1.20	10	24.9
B10	6-5-63	16	1.2	14.8	1.00	10	27.0
B11	6-5-63	16	1.1	14.9	1.45	10	22.8
B12	6-5-63	16	1.4	14.6	0.80	10	31.8
B13	6-5-63	16	1.0	15.0	1.00	10	27.0
B14	6-5-63	16	3.7	12.3	0.60	10	38.5
B15	6-5-63	16	3.2	12.8	—	8	R
B16	6-5-63	16	2.5	13.5	0.40	10	48.8
17	6-5-63	16	5.1	10.9	0.65	10	38.6
18	6-5-63	16	2.4	13.6	0.30	10	59.5
19	6-5-63	16	3.3	12.7	0.75	10	35.1
20	6-5-63	16	0.3	15.7	0.70	10	36.8
B21	6-5-63	16	1.6	14.4	0.85	10	30.4
B22	6-5-63	16	0.8	15.2	0.80	10	31.8
B23	6-5-63	16	2.0	14.0	1.05	10	26.1
B24	6-6-63	16	0.8	15.2	1.25	10	22.8
B25	6-6-63	16	1.0	15.0	1.20	10	23.6
B26	6-6-63	16	3.4	12.6	1.00	10	27.0
27	6-6-63	16	0.8	15.2	0.80	10	33.6
28	6-6-63	16	5.2	10.8	—	10	R
29	6-6-63	16	3.0	13.0	1.10	10	26.6
30	6-6-63	16	4.3	11.7	0.70	10	35.8
B31	6-6-63	16	1.0	15.0	1.35	10	21.5
B32	6-6-63	16	2.6	13.4	0.90	10	29.2
B33	6-6-63	16	7.9	8.1	R	10	—

Pier No. 1 East Bound Lane

Pile no.	Date Driven	Length in leads nearest ft.	Length cut off nearest .1 ft.	Length in Leads	Ave. Pen. last 5 blows (inches)	Drop in feet	Bearing in tons
B1	7-17-63	16	0.3	15.7	0.60	5	19.3
B2	7-17-63	16	8.3	7.7	R	5	—
B3	7-17-63	16	7.0	9.0	0.25	5	30.5
B4	7-17-63	16	1.4	14.6	0.45	5	22.9
5	7-17-63	16	6.2	9.8	0.30	5	29.8
6	7-17-63	16	7.9	8.1	R	5	—
7	7-17-63	16	5.1	10.9	0.05	5	38.8
8	7-17-63	16	0.2	15.8	0.30	5	29.8
9	7-17-63	16	8.2	7.8	R	5	—
B10	7-17-63	16	4.2	11.8	0.35	5	26.2
B11	7-17-63	16	6.8	9.2	R	5	—
B12	7-17-63	16	1.2	14.8	0.25	5	30.5
B13	7-17-63	16	5.9	10.1	0.20	5	33.3
B14	7-16-63	16	9.5	6.5	R	5	—
B15	7-16-63	16	8.0	8.0	R	5	—
B16	7-16-63	16	11.2	4.8	R	5	-
17	7-16-63	16	7.2	8.8	0.30	5	28.8
18	7-16-63	16	3.5	12.5	0.30	5	28.8
19	7-16-63	16	7.8	8.2	R	5	—
20	7-16-63	16	4.7	11.3	0.25	5	32.35
B21	7-16-63	16	11.3	4.7	R	5	—
B22	7-16-63	16	8.0	8.0	0.25	5	33.3
B23	7-16-63	16	4.3	11.7	0.10	5	40.8
B24	7-16-63	16	6.8	9.2	0.20	5	33.3
B25	7-16-63	16	8.2	7.8	R	5	—
B26	7-16-63	16	5.0	11.0	0.05	5	45.5
27	7-17-63	16	7.2	8.8	0.05	5	48.3
28	7-16-63	16	7.9	8.1	0.10	5	40.8
29	7-17-63	16	6.9	9.1	R	5	—
30	7-17-63	16	6.4	9.6	0.075	5	45.5
B31	7-17-63	16	5.8	10.2	0.45	5	22.9
B32	7-17-63	16	7.2	8.8	0.45	5	22.9
B33	7-17-63	16	8.4	7.6	0.20	5	33.3
34	7-23-63	8	3.6	4.4	0.45	5	25.3
35	7-23-63	8	2.8	5.2	1.00	10	29.9
B36	7-23-63	8	1.3	6.7	0.80	10	33.2
B37	7-23-63	8	3.0	5.0	0.75	10	34.8
B38	7-23-63	8	2.6	5.4	0.10	5	44.9
39	7-23-63	8	1.7	6.3	0.30	5	31.1
40	7-23-63	8	1.7	6.3	0.10	5	44.9



Pier No. 3 East Bound Lane

Pile no.	Date Driven	Length in leads nearest ft	Length cut off nearest .1 ft	Length in Structure	Ave. Pen. last 5 blows (inches)	Drop in feet	Bearing in tons
B1	6-19-63	16	1.9	14.1	0.75	10	33.2
B2	6-19-63	16	0.8	15.2	1.65	10	18.3
B3	6-19-63	16	1.8	14.2	1.00	10	27.0
B4	6-19-63	16	2.2	13.8	1.30	10	23.1
5	6-19-63	16	3.1	12.9	R	6	—
6	4-26-63	20	2	18			66.7
7	6-19-63	16	5.9	10.1	0.50	10	45.4
8	6-19-63	16	2.5	13.5	0.50	10	45.4
9	6-19-63	16	1.4	14.6	1.30	10	33.4
B10	6-19-63	16	6.6	9.4	0.20	5	49.8
B11	6-19-63	16	2.5	13.5	0.80	10	31.7
B12	6-19-63	16	9.4	6.6	0.60	10	38.5
B13	6-19-63	16	8.3	7.7	R	7	—
B14	6-18-63	16	8.1	7.9	R	5	—
B15	6-18-63	16	8.4	7.6	R	5	-
B16	6-18-63	16	3.0	13.0	0.60	10	38.5
17	6-18-63	16	3.1	12.9	0.90	10	31.5
18	6-18-63	16	3.5	12.5	1.05	10	27.6
19	6-18-63	16	6.8	9.2	R	10	—
20	6-18-63	16	7.2	8.8	R	10	—
B21	6-19-63	16	7.5	8.5	R	5	—
B22	6-18-63	16	7.8	8.2	R	10	—
B23	6-18-63	16	9.0	7.0	R	5	—
B24	6-18-63	16	5.7	10.3	0.85	10	30.9
B25	6-18-63	16	5.6	10.4	0.35	10	52.1
B26	6-18-63	16	8.5	7.5	R	5	—
27	6-18-63	16	1.5	14.5	0.65	10	38.6
28	6-19-63	16	1.8	14.2	0.60	10	40.7
29	6-18-63	16	1.5	14.5	0.80	10	33.6
30	6-18-63	16	6.6	9.4	R	5	—
B31	6-18-63	16	1.4	14.6	0.65	10	36.5
B32	6-18-63	16	2.0	14.0	0.60	10	38.5
B33	6-18-63	16	4.2	11.8	0.90	5	31.7

8 ft. Piles

Type of hammer - Gravity
Gross Weight - 3643
Weight of pile - 220
I.H.C. hammer No. - 749
Effective weight - 3600
I.H.C. cap No. - 788
Weight of cap - 992

Formula used.

$P = \frac{3WH}{S+0.35} \times \frac{W}{W+M}$ Vert.

$P = \frac{(3)(1.8)(10)}{S+0.35} \times \frac{3600}{4812}$

$P = \frac{54}{S+0.35} \times 0.748$

$P = \frac{2020}{S+0.35}$ Vert.

(") 0.946 Batt. 1:4

16 ft. Piles

Type of hammer - Gravity
Gross Weight - 3643
Weight of pile - 440
I.H.C. hammer No. - 749
Effective weight - 3600
I.H.C. cap No. - 788
Weight of cap - 992

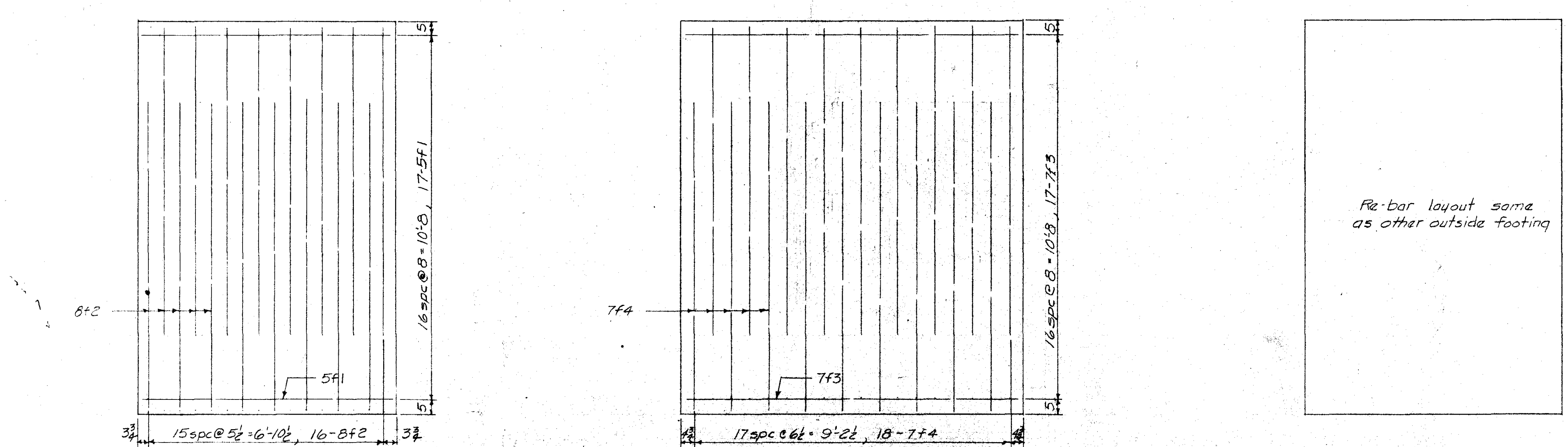
Formula used - $P = \frac{3WH}{S+0.35} \times \frac{W}{W+M}$ Vert.

$P = \frac{(3)(1.8)(10)}{S+0.35} \times \frac{3600}{5032}$

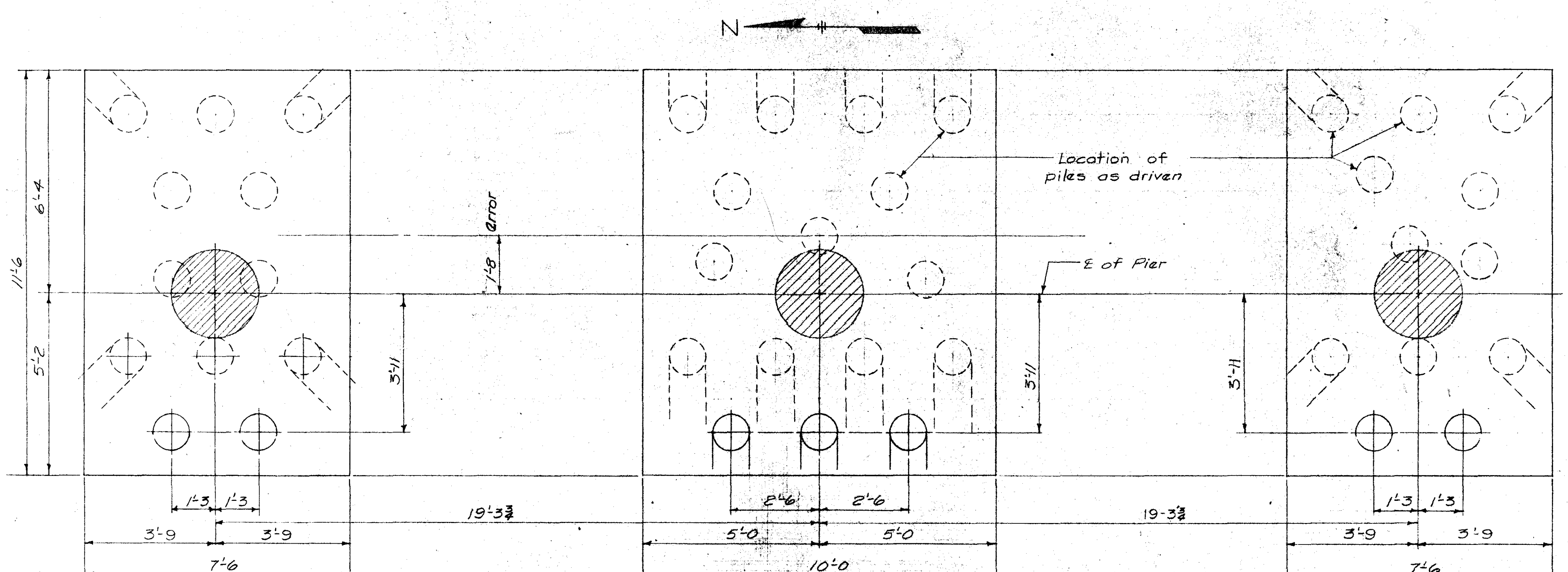
$P = \frac{54}{S+0.35} \times 0.7154$

$P = \frac{38.63}{S+0.35}$ Vert.

(") 0.946 Batt. 1:4



NEW REINFORCING BAR LAYOUT



NEW FOOTING LAYOUT

Scale: ½" = 1'-0

Note: Pile spacing shown at bottom of footing.
Batter new piles 1:4 in the direction shown.

Revised 7-22-63 This sheet added to Design 3261

*ADDITIONAL ESTIMATED QUANTITIES	
Item	Quantity
Concrete	6.2 c.y.
Reinforcing Steel	452 lb.
Creosoted Piling 7@8'	56 L.F.

* See sheet 7 of 23 for revised quantities for Pier Nº 1 E.B. Lane.

Design for 5°13 Skew

DUAL 211'-3 × 30' & VAR. RDWY. PRETENSIONED PRESTRESSED CONCRETE BEAM BRIDGES

43'-1½ & 38'-11½ End Spans 2-64'-7 Interior Spans

Concrete Floor & Substructure Tubular Rail

NEW FOOTING FOR PIER Nº 1 E.B. LANE

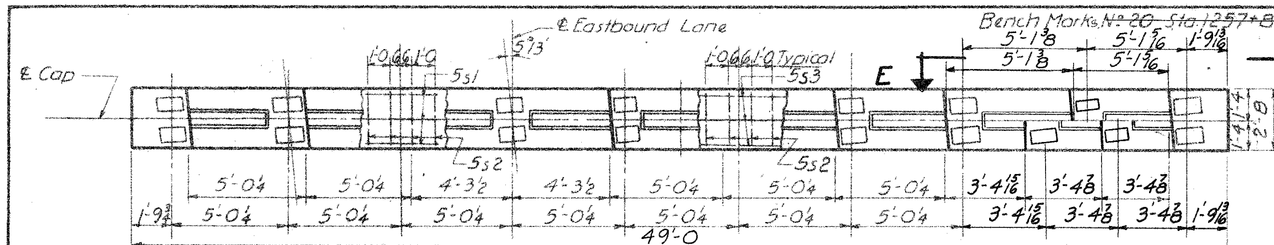
Station 1258+95.48 Project Nº FU-1065(10)

STORY COUNTY

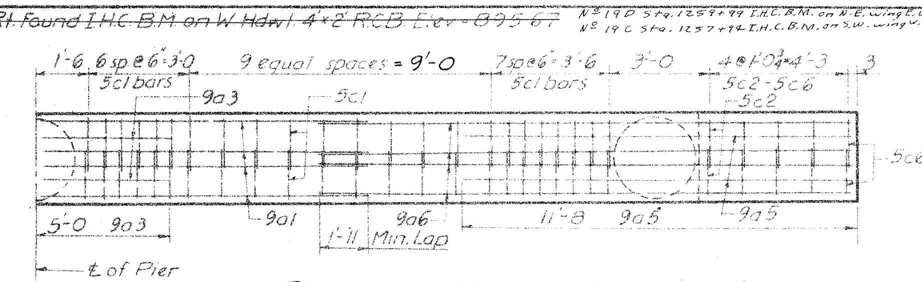
Iowa State Highway Commission

July 1963 Sheet 7a of 23

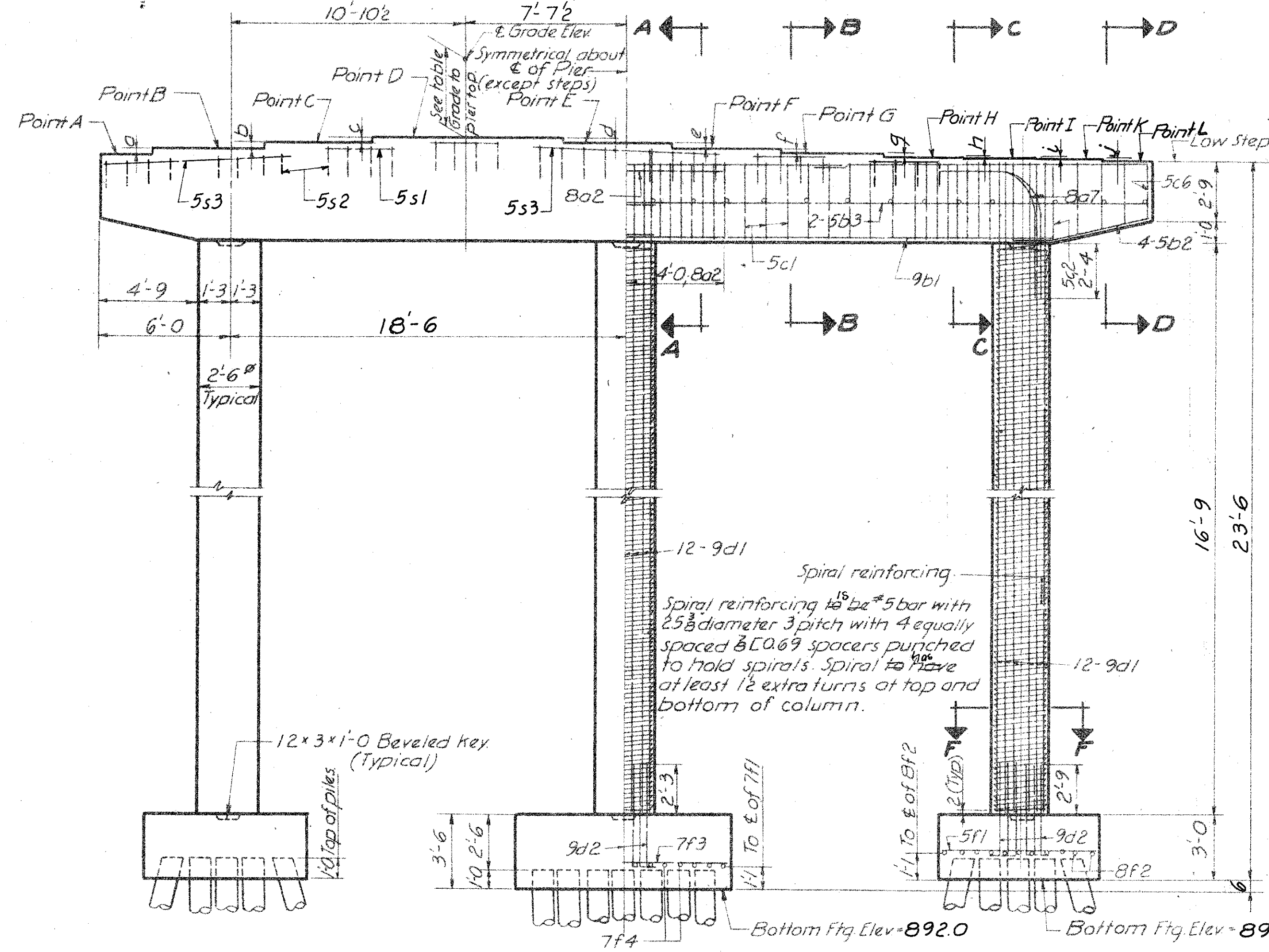
Design Nº 3261 Story County File Nº 21508



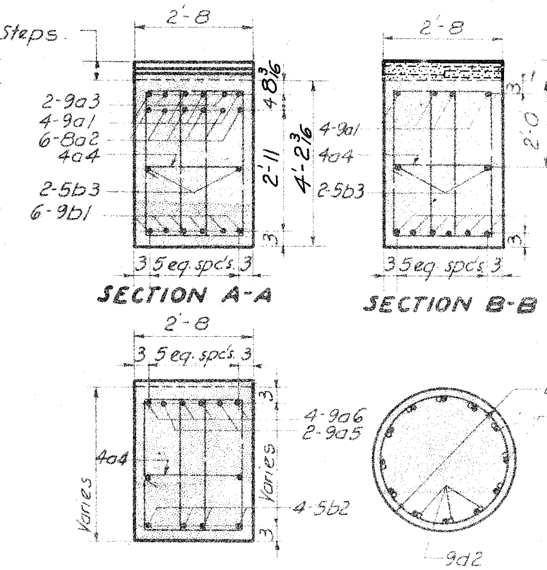
PLAN VIEW OF CAP



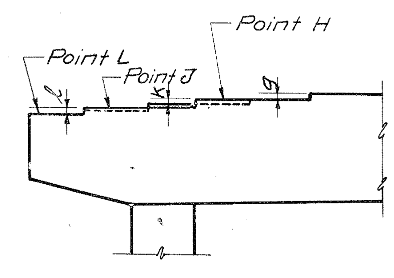
PLAN VIEW (Showing Reinforcement)



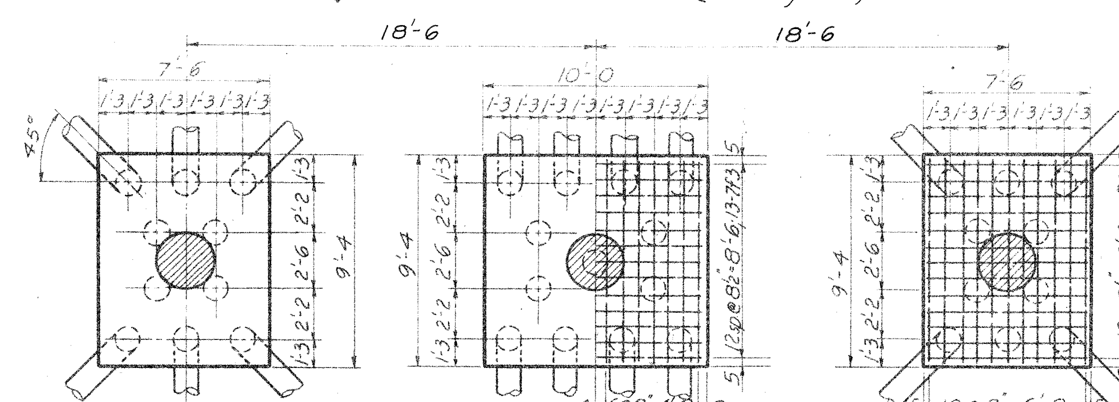
PIER ELEVATION
(Looking East.)



SECTION A-A SECTION B-B SECTION C-C SECTION D-D SECTION F-F



VIEW E-E
(Looking West.)



Pile spacing shown at bottom of footing.
Batter perimeter piles 1:4 in direction shown.
33 piles required.

FOOTING PLAN

NOTE: ℄ of pier is 7'-7½ to right of ℄ of Eastbound Lane.

PIER NOTES.

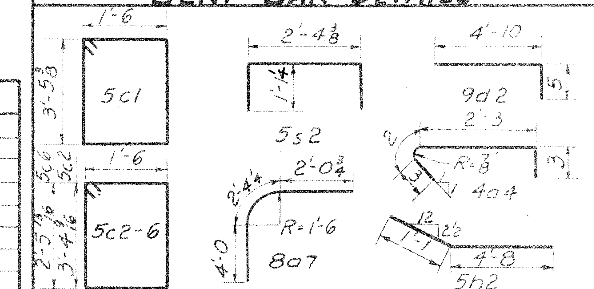
All exposed corners of 90° or sharper ~~are to be~~ were formed with a ¾" dressed and beveled fillet.
Clear distance from face of concrete to near reinforcing bar ~~shall be~~ is 2" unless otherwise shown or noted.
Piles ~~are to be~~ were driven to full penetration if practicable, but in no case to less than 20 ton bearing capacity, but no more than 40 ton bearing value.
The spiral reinforcing ~~may be~~ was spliced by lapping 1½ turns. The length of spiral shown ~~does~~ did not include the lapped length of splices. The cost of laps at splices ~~is to be~~ was included in the price bid for other reinforcement. The spiral reinforcement ~~may be~~ was made of plain structural grade reinforcing steel.

SPECIFICATIONS.

Design: A.A.S.H.O. Series of 1961.
Construction: Standard Specifications of the Iowa State Highway Commission, Series of 1960, plus current supplemental specifications and special provisions.

REINFORCING BAR LIST - ONE PIER					
Bar	Location	Shape	No	Length	Weight
9a1	Beam Longit. Top	—	4	20'-0	272
8a2	" " "	—	6	8'-0	128
9a3	" " "	—	2	10'-0	68
4a4	Beam Transverse		26	2'-10	49
9a5	Beam Longit. Top	—	4	11'-6	156
9a6	" " "	—	8	16'-3	442
8a7	" Corner		8	8'-5	180
9b1	Beam Horiz. Bottom	—	12	20'-3	826
5b2	Cantilever "		8	5'-9	48
5b3	Beam Intermediate	—	4	24'-11	104
5c1	Beam Hoops		92	10'-7	1016
5c2-6	" " Ends		20	Varies	200
9d1	Column Vert.	—	36	20'-2	2468
9d2	" Dowels		36	5'-1	622
5f1	Footing Bott. Transv.	—	26	7'-2	194
8f2	" Longit.	—	22	9'-0	529
7f3	" Transverse	—	13	9'-8	257
7f4	" Longit.	—	14	9'-0	258
5s1	Bridge Seat Longit.	—	12	3'-6	44
5s2	" " Transv.		32	4'-5	147
5s3	" " Longit.	—	6	8'-6	53
	Column Spiral		3	457'-0	1430
	⅞ E0.69 Spiral Spacer	—	12	16'-9	139
				Total lbs.	9630

BENT BAR DETAILS



Note: All dimensions are out to out. Radii to ℄ of bar.

TABLE OF ELEVATIONS	
Point	Elevation
A	916.43
B	916.58
C	916.68
D	916.71
E	916.68
F	916.59
G	916.45
H	916.30
I	916.20
J	916.15
K	916.10
L	916.00
℄ Grade Elev.	920.56
Gr. to Pier Top	3'-10 3/16

TABLE OF PIER STEPS	
a	1 3/16
b	1 3/16
c	3/8
d	3/8
e	1/8
f	1 1/16
g	1 13/16
h	1 3/16
i	1 3/16
j	1 3/16
k	1 13/16
l	1 13/16

CONCRETE PLACEMENT QUANTITIES	
Location	Quantity
Pier Cap (Includes Steps)	20.1 c.y.
Pier Columns	9.1 c.y.
Footing	26.7 c.y.
Total	55.9 c.y. ✓

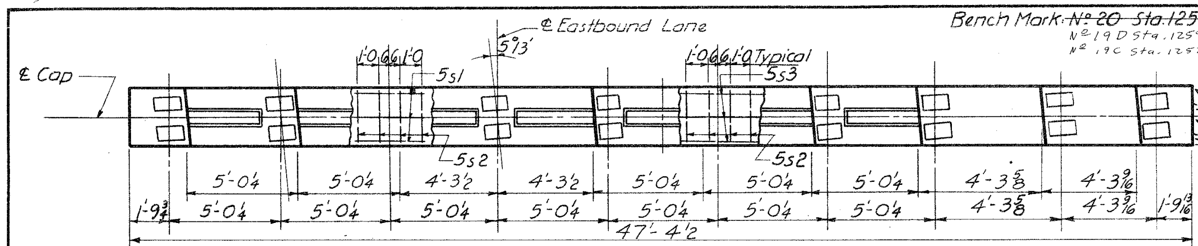
ESTIMATED QUANTITIES		
Item	Unit	Quantity
Concrete	c.y.	55.9 ✓
Reinforcing Steel	lbs.	9630 ✓
Creosoted Piling 33 @ ~~30'~~ 16'	L.F.	~~990~~ 528 ✓
Class 20 Excavation	c.y.	78 ✓

Design for 5°13' Skew
DUAL 211'-3 × 30' ℄ VAR. RDWY. PRETENSIONED PRESTRESSED CONCRETE BEAM BRIDGES
43'-1½ & 38'-11½ End Spans - 2-64'-7 Interior Spans
Concrete Floor & Substructure Tubular Rail
EAST BOUND LANE - PIER No 2 DETAILS
Station 1258+95.48 Project No F.U-1065(10)
STORY COUNTY
Iowa State Highway Commission
September 1962 Sheet 8 of 23

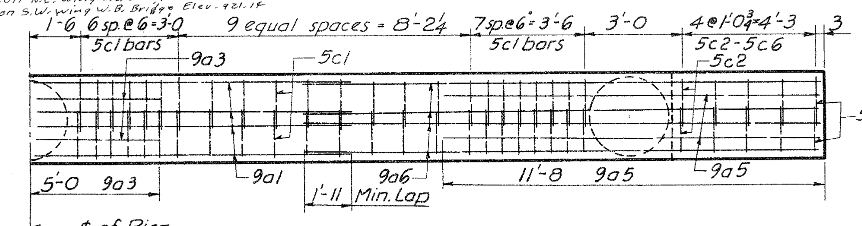
Design No 3261 Story County File No 21508

F

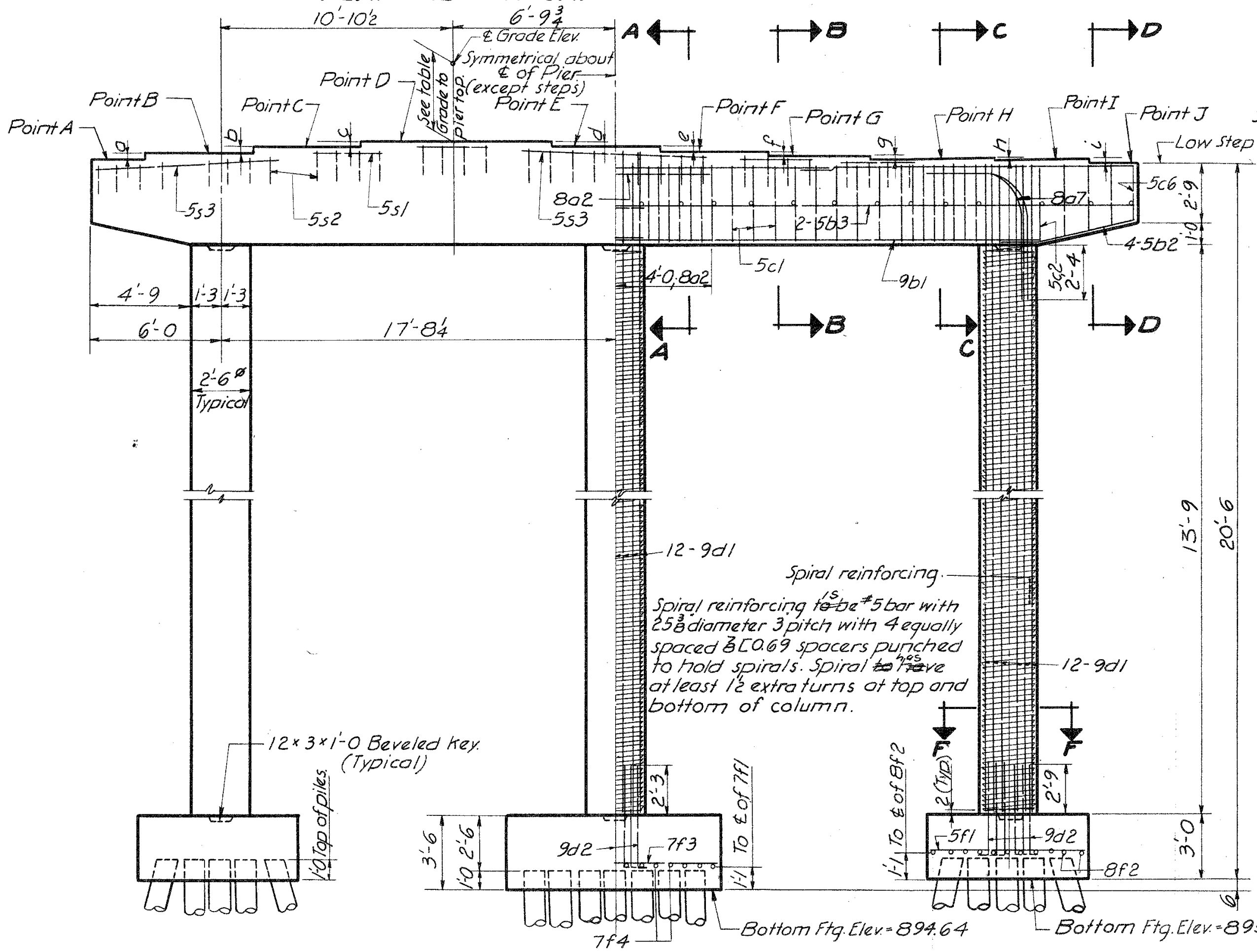
Bench Mark № 20 Sta. 1257+88, 531' Rt. Found I.H.C. B.M. on W. Hdwl. 4×2' R.C.B. Elev.=895.67



PLAN VIEW OF CAP

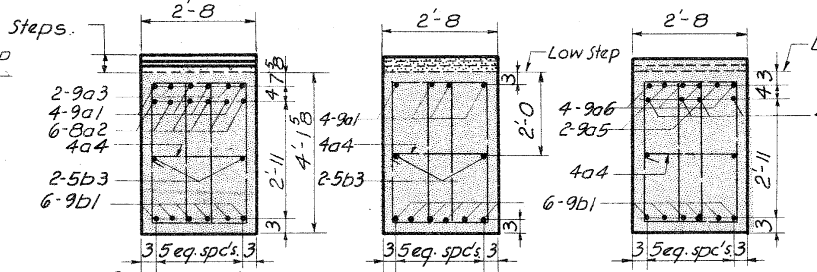


PLAN VIEW (Showing Reinforcement)

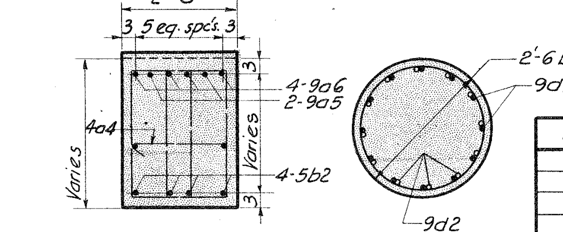


PIER ELEVATION

Spiral reinforcing is #5 bar with 25⅝ diameter 3 pitch with 4 equally spaced 8 E 069 spacers punched to hold spirals. Spiral was at least 1½ extra turns at top and bottom of column.



SECTION A-A SECTION B-B SECTION C-C



SECTION D-D SECTION F-F

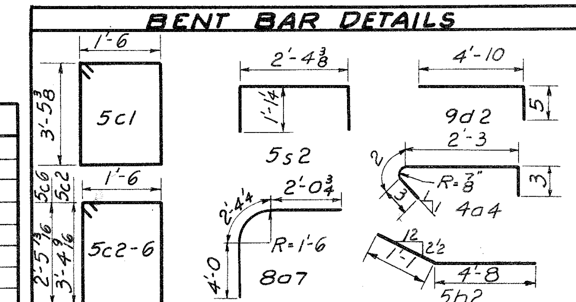
~~PILE TESTING PROCEDURE~~

~~① Drive all footing piling as shown.~~
~~② Then drive test load pile to 20± tons.~~
~~③ The Resident Construction Engineer will notify the Materials Engineer in Ames when the test load pile is ready for loading.~~
~~④ Statically load the test load pile to yield.~~
~~⑤ Complete driving of the test load pile to cut-off elevation. The anchor piling shall be cut-off after test has been completed.~~

REINFORCING BAR LIST - ONE PIER

Bar	Location	Shape	№	Length	Weight
9a1	Beam Longit. Top	—	4	20'-0	272
8a2	" " "	—	6	8'-0	128
9a3	" " "	—	2	10'-0	68
4a4	Beam Transverse		26	2'-10	49
9a5	Beam Longit. Top	—	4	11'-6	156
9a6	" " "	—	8	15'-5	419
8a7	" Corner		8	8'-5	180
9b1	Beam Horiz. Bottom	—	12	19'-5	792
5b2	Cantilever "		8	5'-9	48
5b3	Beam Intermediate	—	4	24'-1	100
5c1	Beam Hoops		92	10'-7	1016
5c2-6	" " Ends		20	Varies	200
9d1	Column Vert.	—	36	17'-2	2101
9d2	" Dowels		36	5'-1	622
5f1	Footing Bott. Transv.	—	26	7'-2	194
8f2	" Longit.	—	22	9'-0	529
7f3	" Transverse	—	13	9'-8	257
7f4	" Longit.	—	14	9'-0	258
5s1	Bridge Seat Longit.	—	12	3'-6	44
5s2	" " Transv.		32	4'-5	147
5s3	" " Longit.	—	6	8'-6	53
	Column Spiral		3	377'-0	1180
	8 E 069 Spiral Spacer	—	12	13'-9	114
				Total lbs.	8927

BENT BAR DETAILS



Note: All dimensions are out to out. Radii to ℄ of bar.

TABLE OF ELEVATIONS

Point	Elevation
A	916.02
B	916.17
C	916.26
D	916.30
E	916.27
F	916.18
G	916.04
H	915.89
I	915.78
J	915.64
℄ Grade Elev.	920.15
Gr. to Pier Top	3'-10 3/16

TABLE OF PIER STEPS

a	1 13/16
b	1/8
c	7/16
d	3/8
e	1/8
f	1 1/16
g	1 13/16
h	1 5/16
i	1 1/16

CONCRETE PLACEMENT QUANTITIES

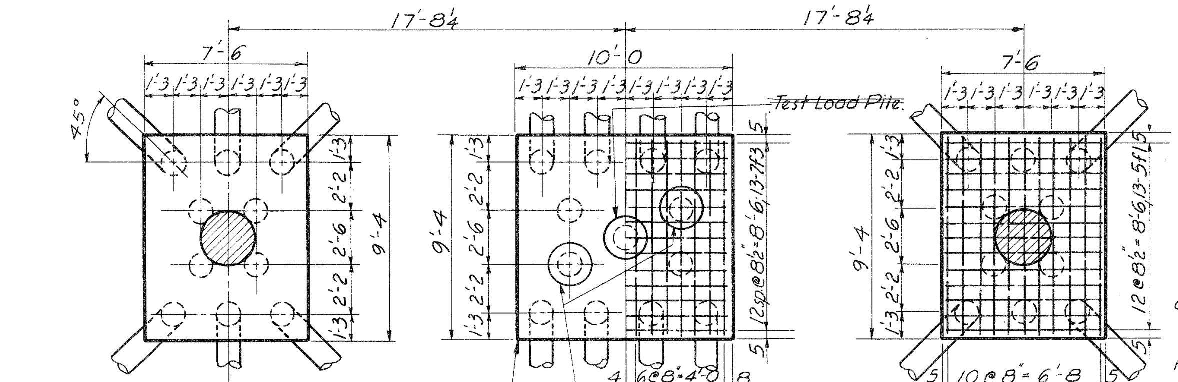
Location	Quantity
Pier Cap (Includes Steps)	19.3 c.y.
Pier Columns	7.5 c.y.
Footing	26.7 c.y.
Total	53.5 c.y.

ESTIMATED QUANTITIES

Item	Unit	Quantity
Concrete	c.y.	53.5
Reinforcing Steel	lbs.	8927
Creosoted Piling 32 @ 30'	L.F.	~~960~~ 51½
Class 20 Excavation	c.y.	71
Creosoted Test Pile 1 @ 30'	L.S.	Lump Sum

~~TEST LOAD PILE NOTE.~~

~~The contractor is to cooperate with the Engineer in the prosecution of the testing and is to assist in setting and removing the test beam. The cost of this work is to be included in the price bid for other items and no separate payment will be made for this work or for delays caused by testing.~~



Pile spacing shown at bottom of footing. Batter perimeter piles 1:4 in direction shown. 33 piles required.

FOOTING PLAN

~~Footing for test pile, the test pile is to be one of the vertical piles.~~

NOTE: ℄ of pier is 6'-9¾ to right of ℄ of Eastbound Lane.

PIER NOTES.

All exposed corners of 90° or sharper were formed with a ¾" dressed and beveled fillet.
Clear distance from face of concrete to near reinforcing bar is 2" unless otherwise shown or noted.
Piles were driven to full penetration if practicable, but in no case to less than 20 ton bearing capacity, but no more than 40 ton bearing value.
The spiral reinforcing was spliced by lapping 1½ turns. The length of spiral shown does not include the lapped length of splices. The cost of laps at splices was included in the price bid for other reinforcement. The spiral reinforcement was made of plain structural grade reinforcing steel.

SPECIFICATIONS.

Design: A.A.S.H.O. Series of 1961.
Construction: Standard Specifications of the Iowa State Highway Commission, Series of 1960, plus current supplemental specifications and special provisions.

Design for 5°13' Skew

DUAL 211'-3 × 30' & VAR. RDWY. PRETENSIONED PRESTRESSED CONCRETE BEAM BRIDGES

43'-1½ & 38'-11½ End Spans - 2-64'-7 Interior Spans
Concrete Floor & Substructure Tubular Rail

EAST BOUND LANE - PIER № 3 DETAILS

Station: 1258+95.48 Project № F.U.-1065(10)

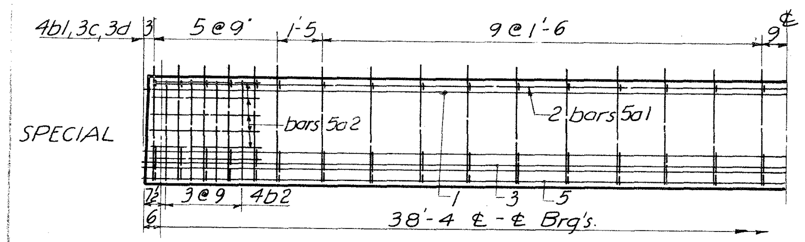
STORY COUNTY

Iowa State Highway Commission
September 1962 Sheet 9 of 23

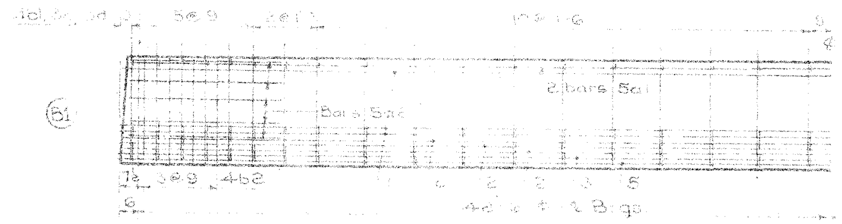
Design № 3261 Story County File № 21508

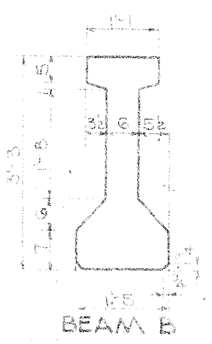
Designed by: B.F. Traced by: [illegible] Checked by: R.D.U.

DIETZGEN NO. 131 ARKWRIGHT

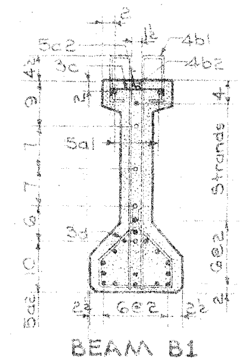


SPECIAL

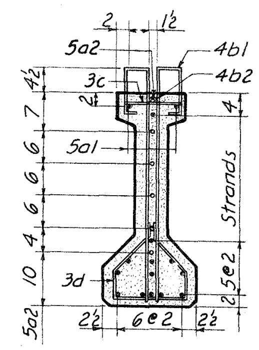




BEAM B

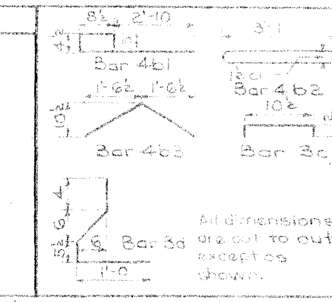


BEAM B1



SPECIAL

REINFORCING BAR LIST							
Beam		B1		Special		B6	
Span		42'-6		38'-4		63'-4	
Bar	Shape	Nº	Length	Nº	Length	Nº	Length
5a1	——	4	22'-6	2	38'-11	4	32'-11
4a2	——	—	—	—	—	2	4'-6
5a2	——	10	5'-0	12	5'-6	—	—
4b1	⊏	72	4'-8	64	4'-8	104	4'-8
4b2	⊂⊃	8	6'-2	8	6'-2	12	6'-2
4b3	⌒	—	—	—	—	12	3'-5
3c	⊓	36	1'-2	32	1'-2	52	1'-2
3d	∠	72	2'-4	64	2'-4	104	2'-4



BEAM DATA				
Beam		B1	Special	B6
Span		42'-6	38'-4	63'-4
① Initial Prestress	Kips	321	246	529
Strand Size		7/16	7/16	7/16
Straight Strands		17	13	22
Deflected Strands		—	——	6
Hold Down Stress	Kips	—	——	11.5
Camber	in.	.34	0.21	1.16
② D.L. Deflection in. (5'-0 Spcg.)		.15	0.11	.75
② D.L. Deflection in. (6'-6 Spcg.)		.20	——	.95
Reinforcing Steel	lb	481	452	658
Concrete	c.y.	4.28	3.84	6.33

① Increase 5% if artificial curing is to be used. ② Due to weight of slab

NOTES:

Unless otherwise specified an allowance of .0005 L. ~~is to be~~ WAS made on all beams for shrinkage and elastic shortening.

All deflected strands ~~are to be~~ WERE held down at the third points of the beams except that the hold down point may HAVE been moved toward the center of the beam a distance not to exceed .05 span at the producer's option.

Tops of beams ~~are to be~~ WERE scored transversely at about 3" centers with a pointed tool. Scores are ~~to be~~ 1/8" deep.

Hold down devices and procedure for tensioning and detensioning ~~must be~~ WERE approved by the Engineer.

Bearing details ~~will be~~ IS as detailed on specific designs.

Unless otherwise noted, the cost of bearing details, including masonry plates and/or neoprene pads, coil ties, coil rods and lifting loops ~~is to be~~ WAS included in the price bid for prestressed concrete beams.

Strand ends ~~which will be~~ encased in concrete in the finished structure are ~~to be~~ cut with a 1" projection with the exception of four strands at the pier end of the beam which are ~~to be~~ cut with a 9" projection and bent as detailed. Strand ends ~~which will be~~ exposed in the finised structure are ~~to be~~ cut flush and painted with 2 coats of red lead at plant.

DESIGN STRESSES: Design stresses for the following materials are in accordance with A.A.S.H.O. Standard Specifications for Highway Bridges, Series of 1961:

Reinforcing steel in accordance with Section 1.4.12. "Reinforcement" for Intermediate, Hard or Rail Steel Grade.

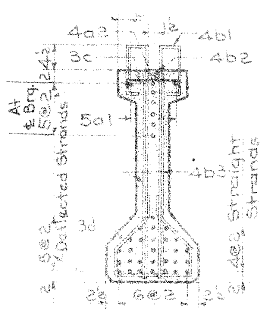
Concrete in accordance with 1.13.7. f'_c = 5000 p.s.i. Prestressing steel in accordance with 1.13.7. f'_s = 250,000 p.s.i.

SPECIFICATIONS:

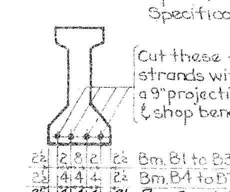
DESIGN: A.A.S.H.O. Series 1961.

CONSTRUCTION: Standard Specifications of the Iowa State Highway Commission, current series, plus current Special Provisions and current Supplemental Specifications.

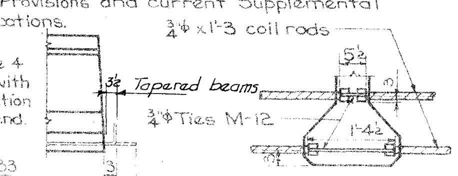
MAXIMUM SPACING OF BEAMS FOR SPANS SHOWN		
Loading	Future W.S.	Maximum Spacing
H-20-S16 (Primary)	19#/□'	5'-0
H-20 (Primary)	19#/□'	6'-0
H-20 (Secondary)	19#/□'	6'-6
H-15 (Secondary)		7'-3



BEAM B6



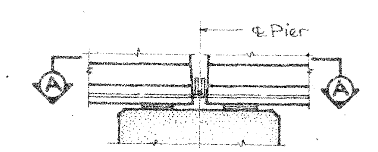
BEAM END DETAIL AT PIER



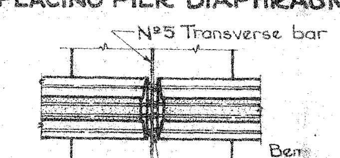
COIL TIE DETAIL

Number and location of coil ties to be as detailed on specific designs.

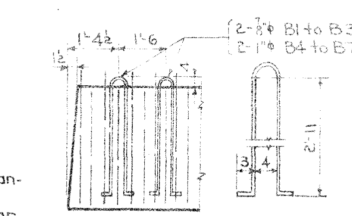
Coil ties and anchors are ~~to be~~ as manufactured by the Superior Concrete Products Co., Richmond Screw Anchor Co. or an approved equal.



DETAILS AT PIER BEFORE PLACING PIER DIAPHRAGM



SECTION A-A



LIFTING LOOP DETAILS

Lifting loops are ~~to be~~ structural grade steel. Alternate types may HAVE been substituted with the approval of the Engineer.

Design for 5°13' Skew

DUAL 211'-3 × 30' & VAR. RDWY. PRETENSIONED PRESTRESSED CONCRETE BEAM BRIDGES

43'-1½ & 38'-11½ End Spans – 2-64'-7 Interior Spans

Concrete Floor & Substructure Tubular Rail

BEAM DETAILS

Sta. 1258+95.48 E. Bound Lane
Sta. 1259+02.23 W. Bound Lane
Project Nº FU-1065(10)

STORY COUNTY

Iowa State Highway Commission
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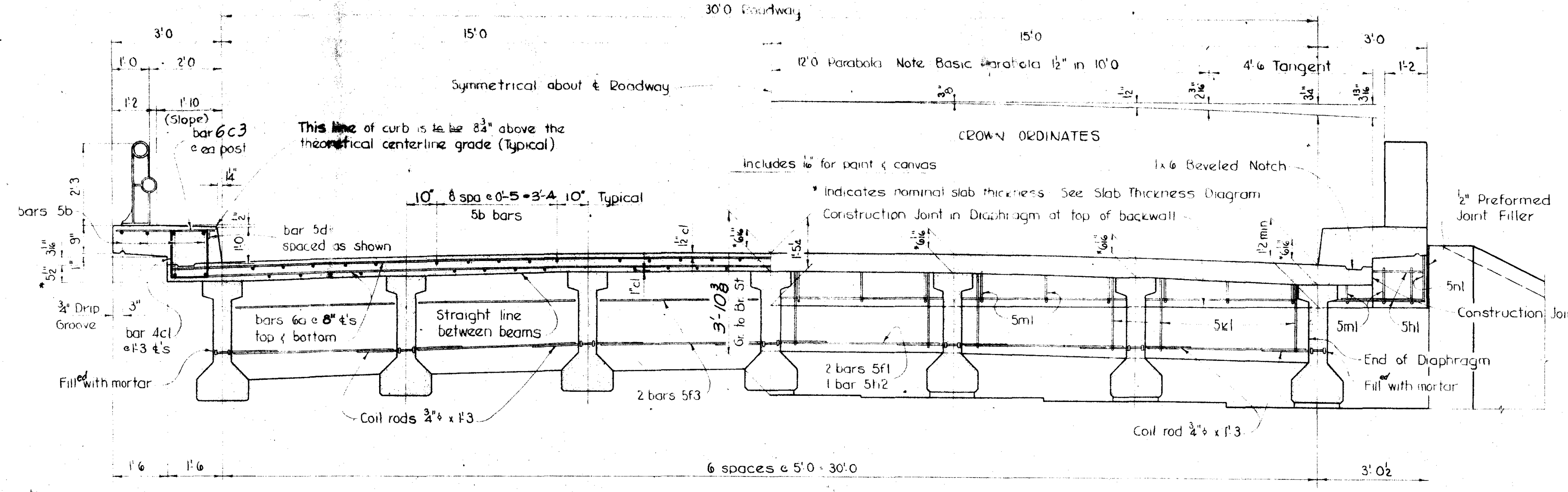
Sheet 10 of 23

Design Nº 3261 Story County File Nº 21508

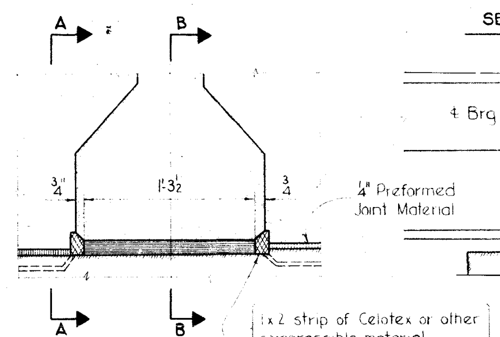
Revised 1-3-62: Score note changed; Specifications changed

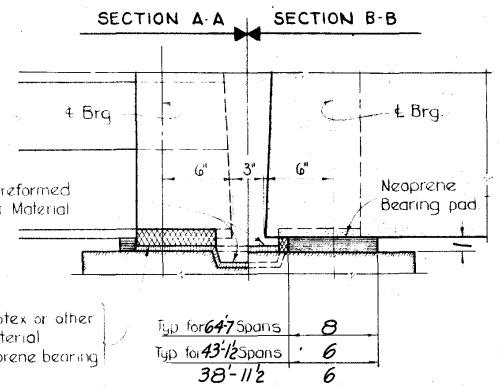


HALF SECTION NEAR MID SPAN

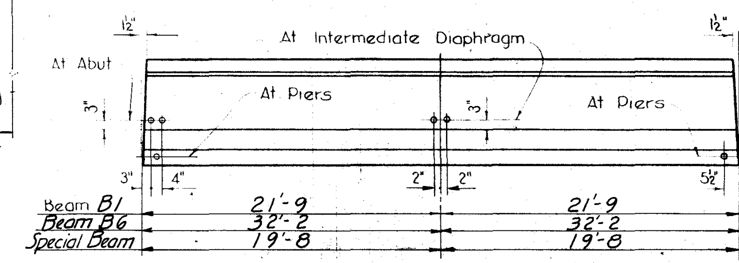
HALF SECTION NEAR ABUTMENT

Area of Slab = 16 692 s f
Area of Curb = 2 689 s f

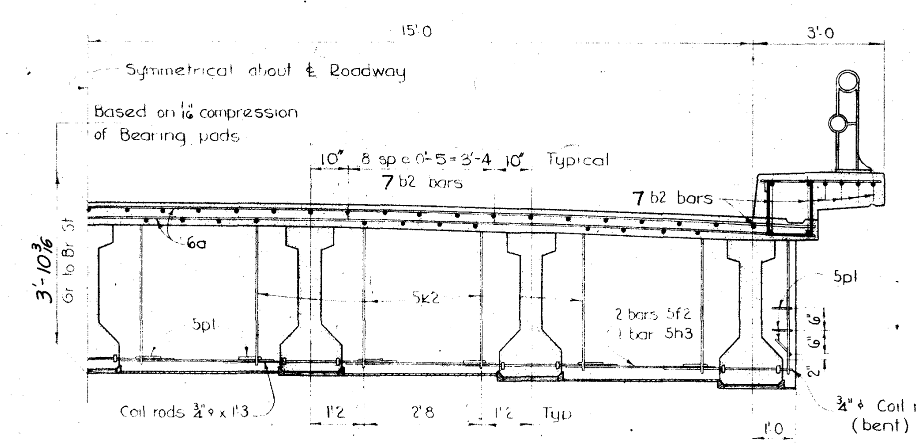




PIER BEARING DETAILS



LOCATION OF BEAM COIL TIES



HALF SECTION NEAR PIER

SUPERSTRUCTURE NOTES:

This bridge ~~is~~ was designed for H20-S16-44 Loading, plus 19 lbs per sq ft of roadway for future wearing surface and alternate loading designated in BPR PPM 20-4, Section 4c.

Concrete in slab ~~is to have~~ had a 28 day crushing strength of 3500 p.s.i. and ~~is to~~ contains no Class "V" aggregate. It ~~is to be~~ was placed as dry as practicable to reduce shrinkage to a minimum and special precaution ~~is to be~~ was taken to secure complete bond between beams and slab. All exposed corners of 90° or sharper ~~are to be~~ were filleted ¾".

Clear distance from face of concrete to near reinforcing bar is ~~to be~~ 1½" unless otherwise noted or shown.

All reinforcing ~~is to be~~ was securely wired in place and adequately supported on metal bar chairs before placing concrete.

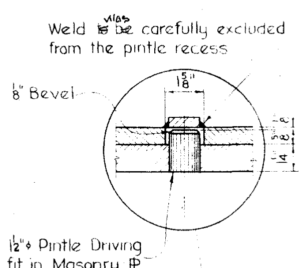
Cost of all bearing material ~~is to be~~ was included in price bid for the beam.

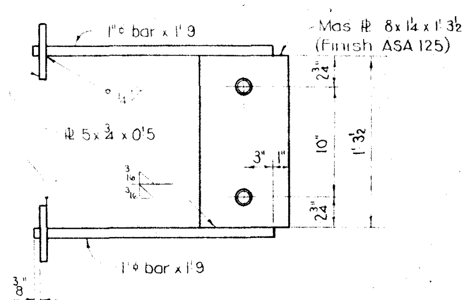
Cost of all preformed joint material ~~is to be~~ was included in price bid for concrete.

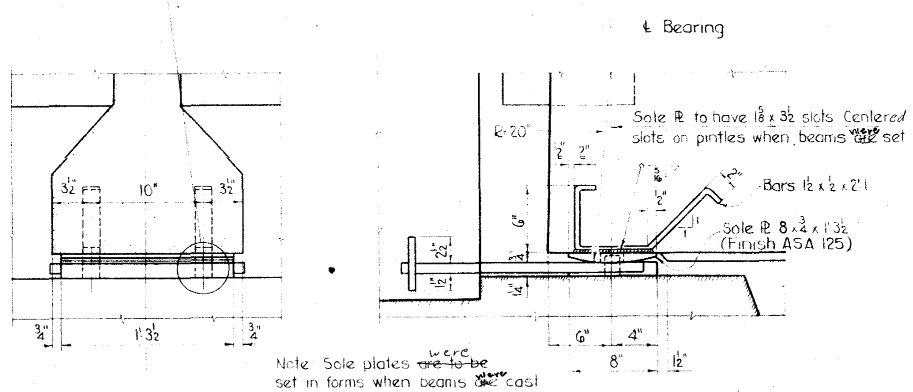
Slab as shown includes ½" of wearing surface.

Forms for slab and curbs ~~are to be~~ were supported by the beams.

For Pretensioned Prestressed Concrete Beam Details see Sheet 10.







ABUTMENT BEARING DETAILS

SPECIFICATIONS:

Design: AASHO Series of 1961. See Sheet 1 for stresses.
Construction: Standard Specifications of I.S.H.C. Series of 1960, plus current special provisions and current Supplemental Specifications.

Revised 1-3-62: Specifications changed.

Design for 5°13' Skew

DUAL 211'-3 x 30' & VAR. RDWY. PRETENSIONED PRESTRESSED CONCRETE BEAM BRIDGES

43'-1½ & 38'-11½ End Spans — 2-64'-7 Interior Spans

Concrete Floor & Substructure — Tubular Rail

W. BOUND LANE - SUPERSTRUCTURE DETAILS

Station 1259+02.23 W. Bound Lane — Project No. FU-1065(10)

STORY COUNTY

Iowa State Highway Commission

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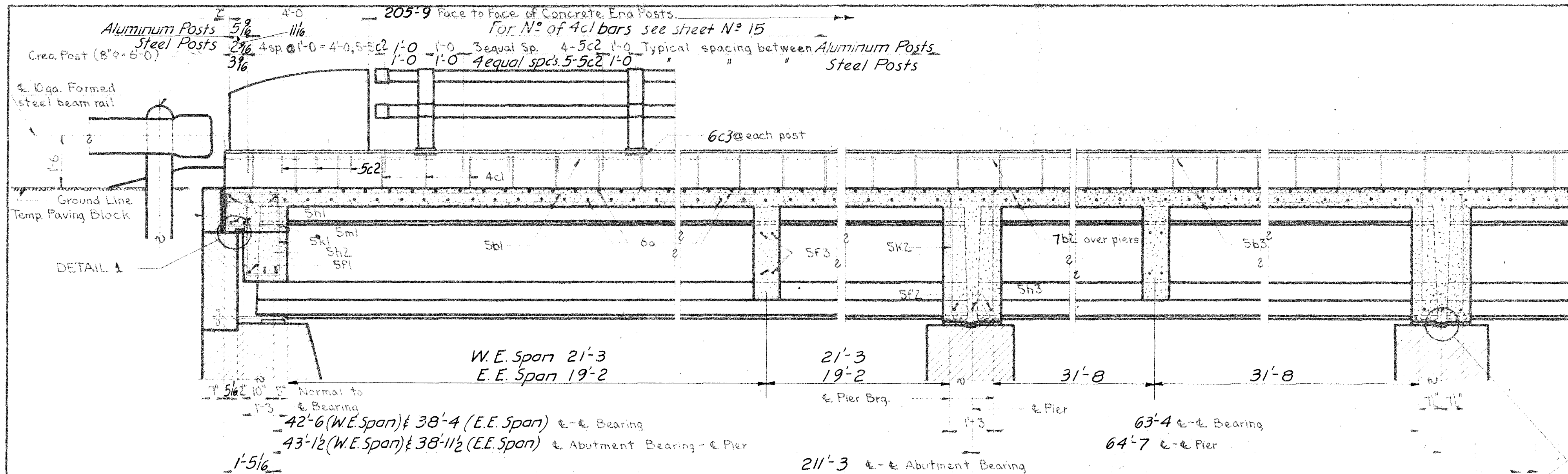
Design No. 3261 — Story County — File No. 21508

This sheet is for 30'-0 rdwy. Pretensioned Prestressed Beam bridges using 7-PC60B beam X-sections with skews 0°00' to 7°30' LF

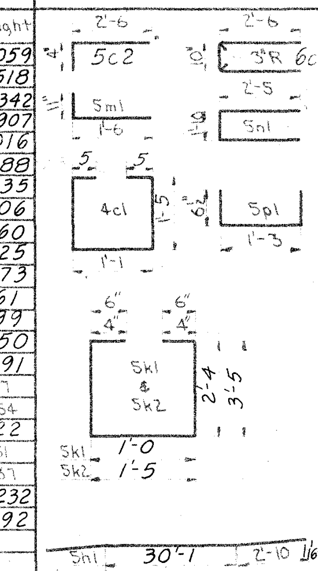


LONGITUDINAL SECTION NEAR CURB
Scale ¼" = 1'-0

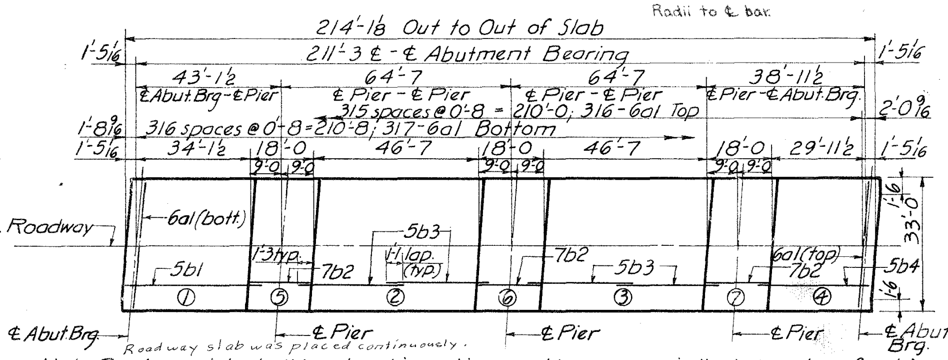
REINFORCING STEEL BAR LIST

Bars	Location	Shape	No.	Length	Weight
6a1	Slab Trans. Top & Bott.	—	633	32'-8	31059
5b1	" & Curb Long. End	—	66	36'-7	2518
7b2	" & " " Over Piers	—	231	17'-8	8342
5b3	" & " " Cent. Sec.	—	264	25'-1	6907
4c1	Curb Hoops	⊔	338	4'-6	1016
5c2	" Trans.	⌐	240	2'-9	688
6c3	Rail Post Anchors	⊏	52	5'-6	435
5f1	Abut. Diaph. Between Bm.	—	24	4'-3	106
5f2	Pier " " "	—	36	4'-3	160
5f3	Interm. " " "	—	96	4'-3	425
5h1	Abut. " Long.	—	10	35'-9	373
5h2	" " "	—	2	29'-4	61
5h3	Pier " "		3	31'-6	99
5k1	Abut. " Hoops	⊔	24	6'-0	150
5k2	Pier " Hoops	⊔	42	8'-11	391
5m1	Abut. " Trans.	∟	48	2'-4	117
5n1	Curb Trans. End	⊏	8	6'-6	54
5p1	Pier Diaphragm	⊔	54	2'-2	122
4s1	End Post Vertical	—	32	2'-10	61
4t1	" " Horiz.	—	16	3'-6	37
5b4	Slab & Curb Longit. End	—	66	32'-5	2232
6b5	Curb Longit. & Drain	—	16	8'-0	192
	Total			lbs.	55545

BAR DETAILS

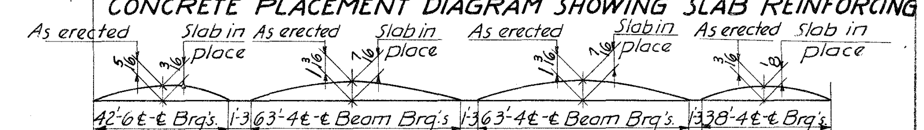


Note: All dimensions are out to out. Radii to ℄ bar.

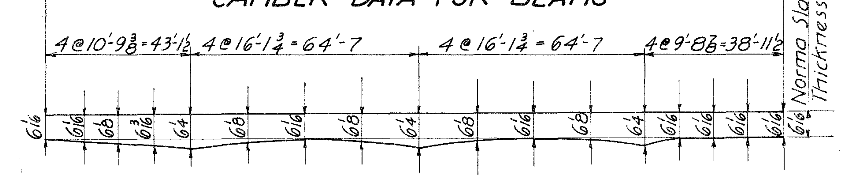


Note: ~~Roadway slab shall be placed in sections and in sequence indicated and preferably at intervals not exceeding 24 hours.~~ Alternate procedures for placing slab concrete ~~may be~~ was submitted for approval together with a statement of the proposed method and evidence that the contractor possessed the necessary equipment and facilities to accomplish the required result. Curbs ~~may be~~ were placed continuously.

CONCRETE PLACEMENT DIAGRAM SHOWING SLAB REINFORCING

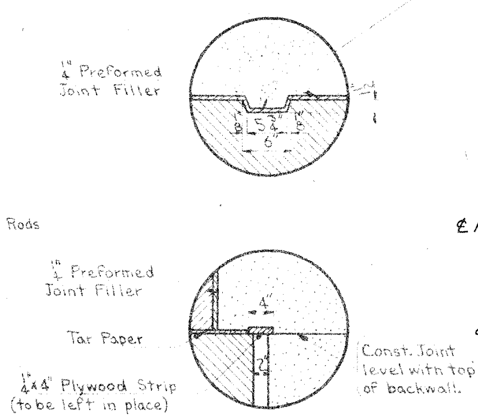


CAMBER DATA FOR BEAMS

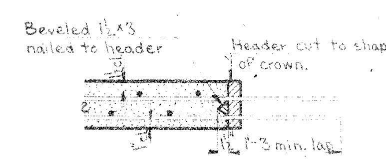


SLAB THICKNESS DIAGRAM

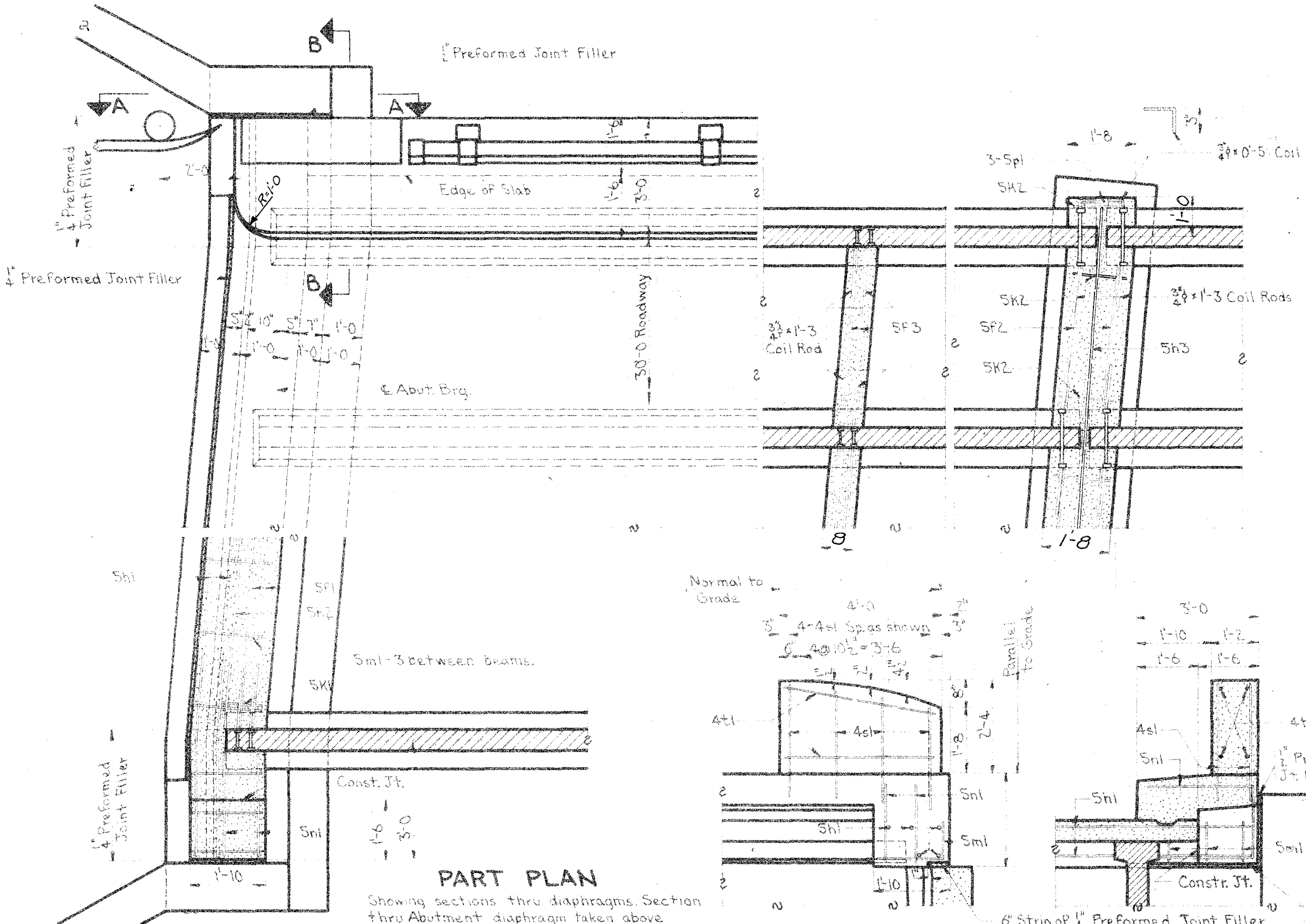
The slab thicknesses shown ~~are~~ were based on the anticipated beam camber remaining after placing the slab and ~~are~~ were not guaranteed for construction. To meet final grade line, slab ~~is to be~~ was thickened to compensate for deficient beam camber & thinned a maximum of ⅛" for excess beam camber.



DETAIL 1



FLOOR CONSTRUCTION JOINT



PART PLAN
Showing sections thru diaphragms. Section thru Abutment diaphragm taken above diaphragm construction joint.

SECTION A-A

SECTION B-B

CONC. PLACEMENT QUANTITIES

Location		Total
Section	1	26.9 c.y.
Section	2 & 3 2@30.5	61.0 "
Section	4	24.2 "
Section	5, 6 & 7 3@17.2	51.6 "
Curbs		43.5 "
End Posts		1.5 "
Total		208.7 c.y.

ESTIMATED QUANT. - SUPERSTR.

Item	Quantity
Concrete c.y.	208.7
Reinforcing Steel lbs	55785
42'-6 (B1) Preten. Prestr. Conc. Bm. only	7
63'-4 (B6) " " " " "	14
38'-4 (Special) " " " " "	7
Aluminum Handrail (℄-℄ End Posts) L.F.	407.3
or	or
~~Steel Handrail (℄-℄ End Posts) L.F.~~	~~407.0~~

Design for 5°13' Skew

DUAL 211'-3 × 30' & VAR. RDWY. PRETENSIONED PRESTRESSED CONCRETE BEAM BRIDGES

43'-1½ & 38'-11½ End Spans — 2-64'-7 Interior Spans

Concrete Floor & Substructure — Tubular Rail

WEST BOUND LANE - SUPERSTRUCTURE DETAILS

Station: 1259+02.23 W. Bound Lane — Project No. FU-1065(10)

STORY COUNTY

Iowa State Highway Commission

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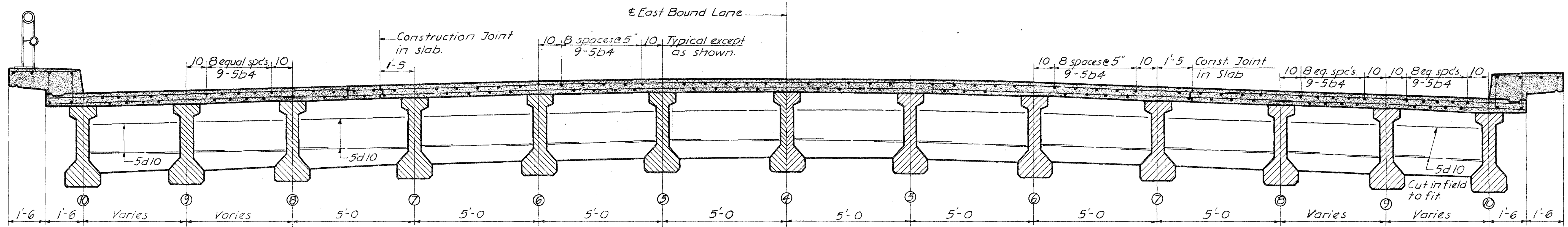
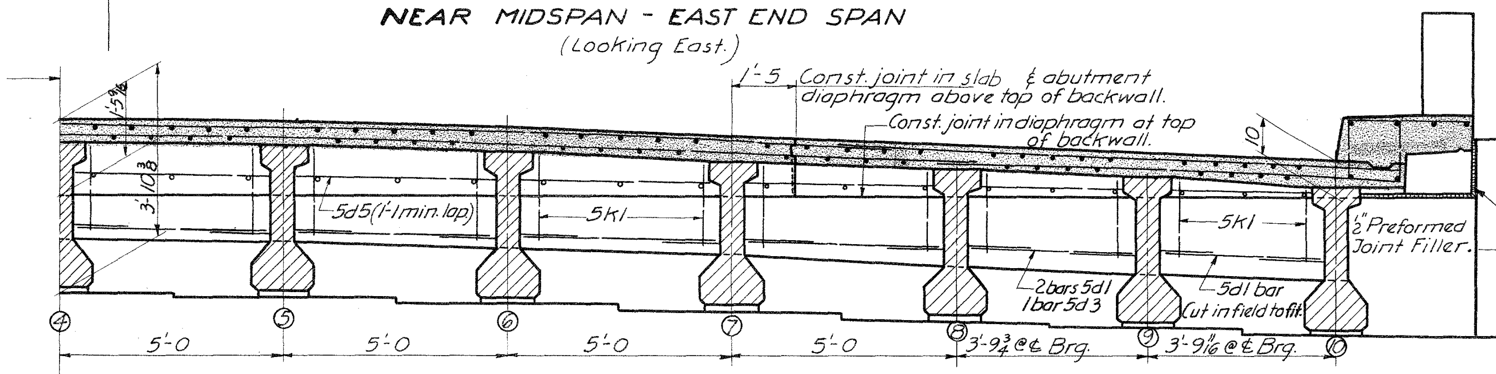
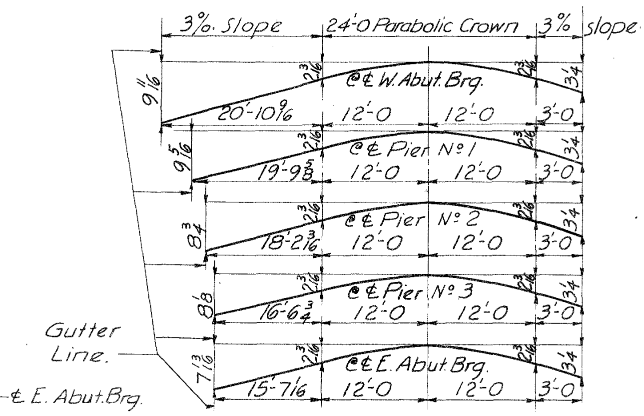


NEAR MIDSPAN - EAST INTERIOR SPAN
(Looking West.)

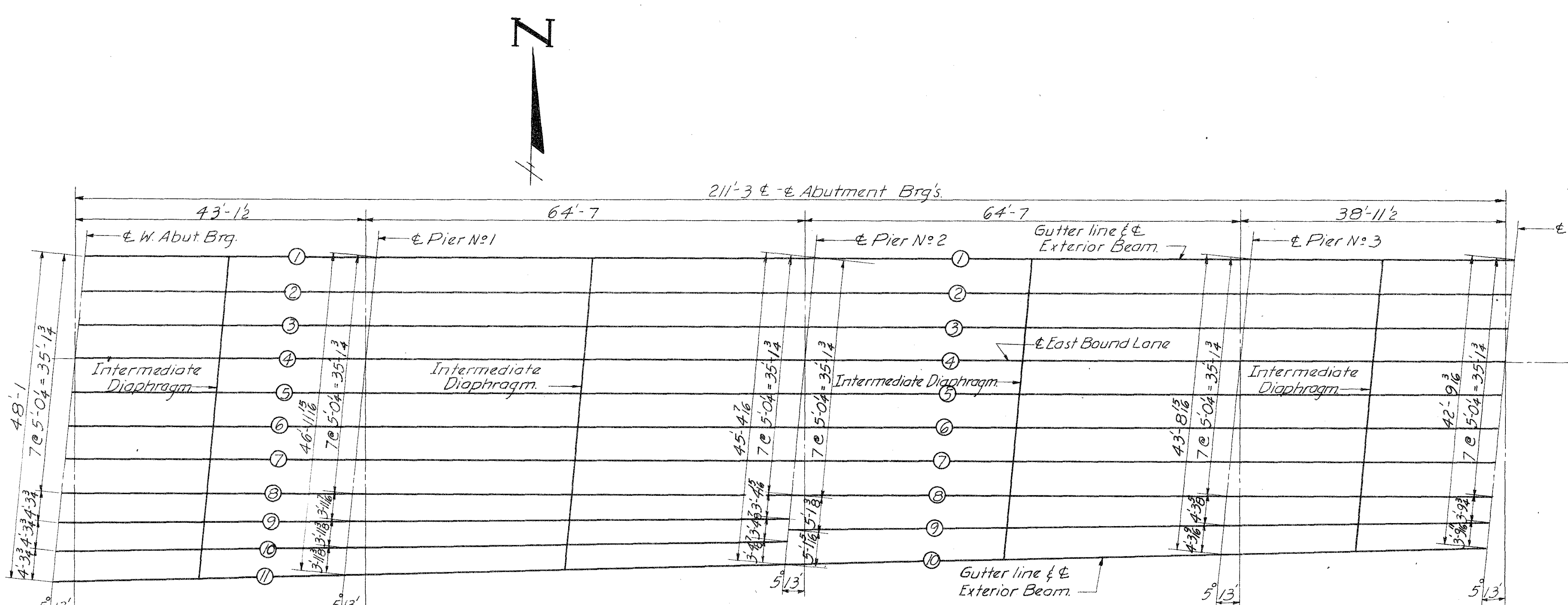
NEAR MIDSPAN - EAST END SPAN
(Looking East.)



EAST ABUTMENT
(Looking East.)

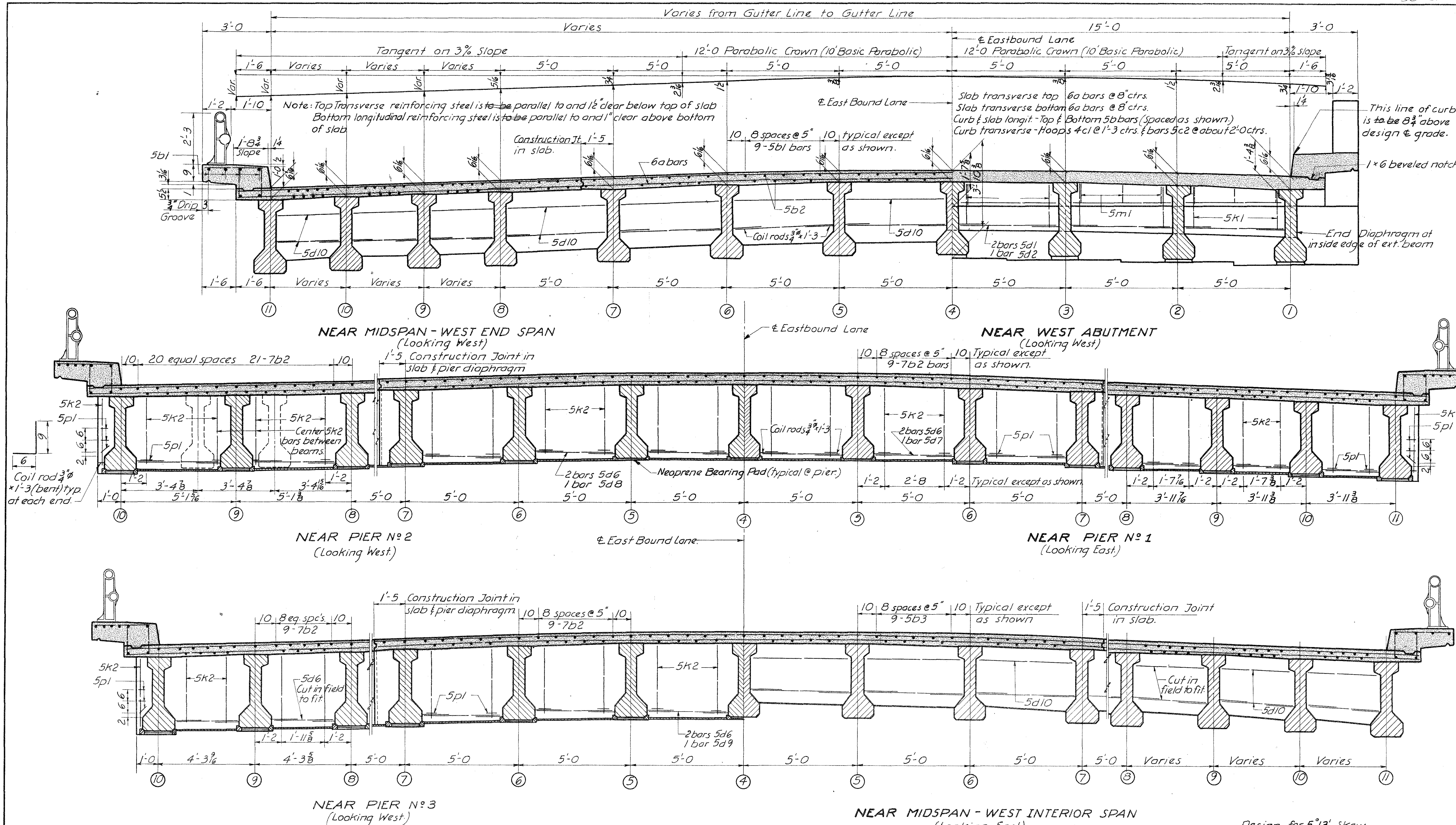


EAST BOUND LANE CROWN ORDINATES
Sections are normal to ℄ Eastbound Lane - Looking West.



EAST BOUND BRIDGE PRESTRESSED BEAM LAYOUT

Design for 5°13' Skew
DUAL 211'-3 × 30' & VARIABLE RDWY. PRETENSIONED PRESTRESSED CONCRETE BEAM BRIDGES
43'-1½ & 38'-11½ End Spans 2-64'-7 Interior Spans
Concrete Floor & Substructure Tabular Rail
EAST BOUND LANE - SUPERSTRUCTURE DETAILS
Station: 1258+95.48 E.B. Lane Project No. FU-1065(10)
STORY COUNTY
Iowa State Highway Commission
September 1962 Sheet 13 of 23
Design No. 3261 Story County File No. 21508



Design for 5°13' Skew

DUAL 211'-3 × 30' & VARIABLE RDWY. PRETENSIONED PRESTRESSED CONCRETE BEAM BRIDGES

43'-1½ & 38'-11½ End Spans 2-64'-7 Interior Spans

Concrete Floor & Substructure Tubular Rail

EAST BOUND LANE - SUPERSTRUCTURE DETAILS

Station: 1258+95.48 E. Bound Lane - Project Nº FU-1065(10)

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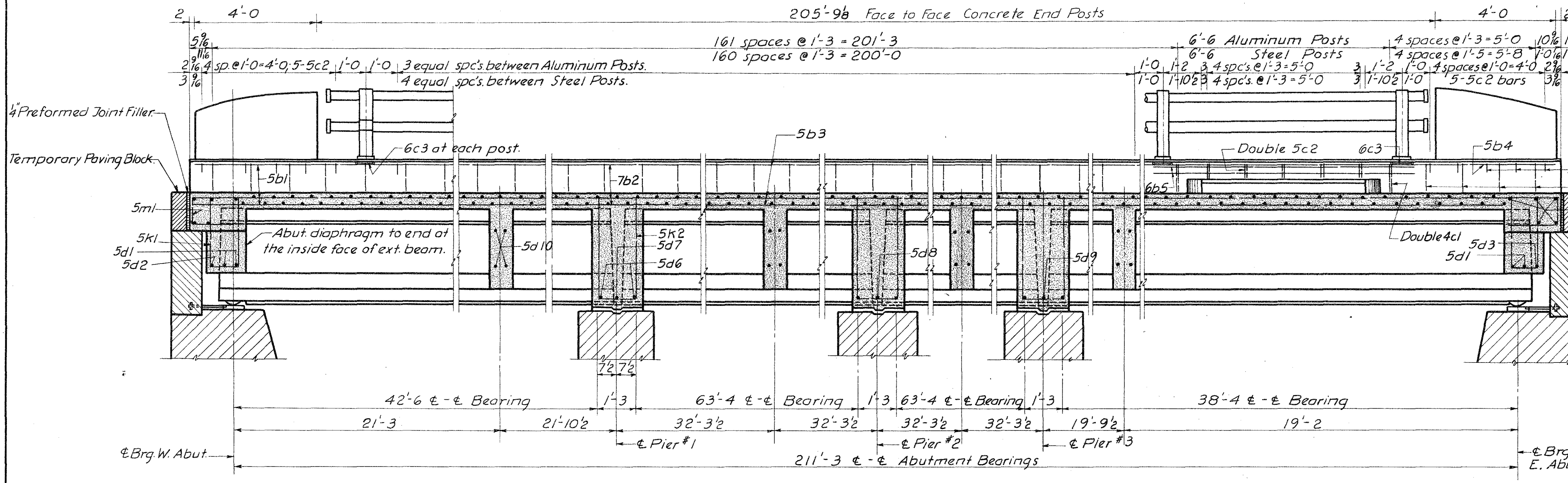
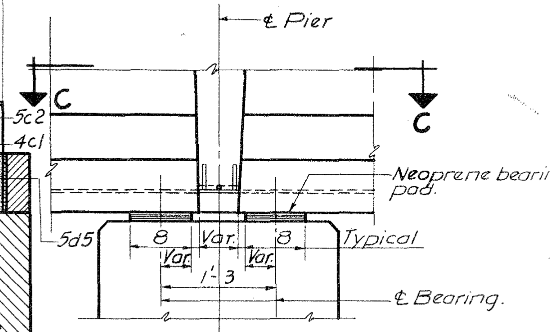
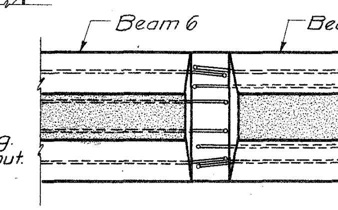
Design Nº 3261 Story County File Nº 21508



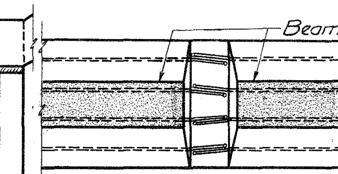
LONGITUDINAL SECTION NEAR CURB



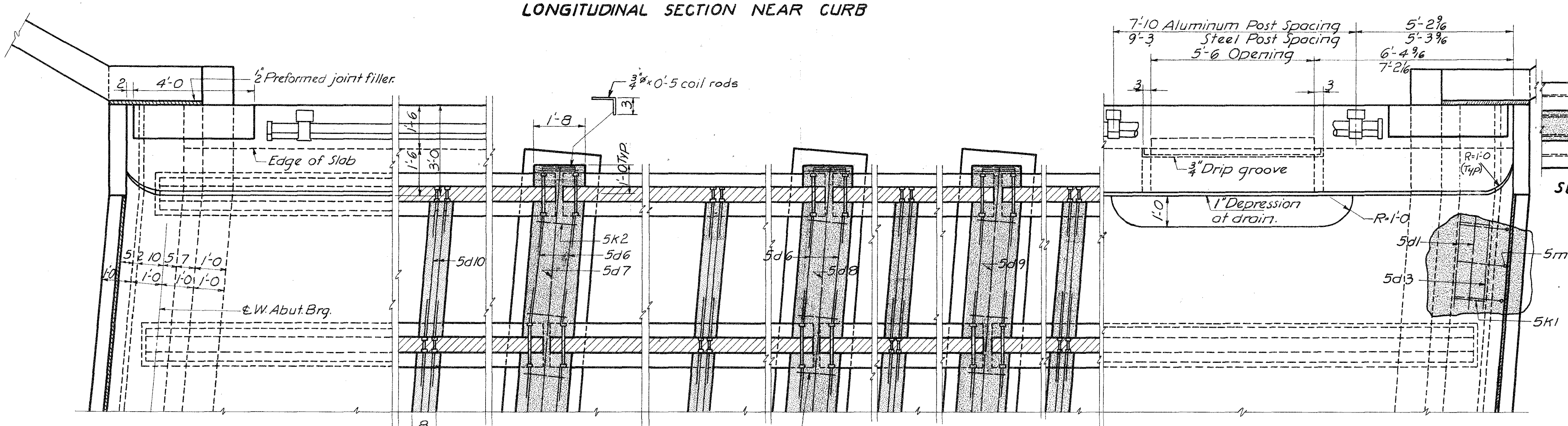
SECTION AT PIER FOR BEAM NOT PARALLEL TO ℄ OF APPROACH PAVEMENT.



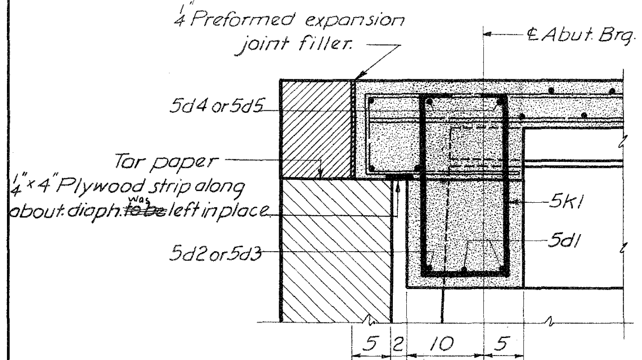
SECTION C-C PIER 1



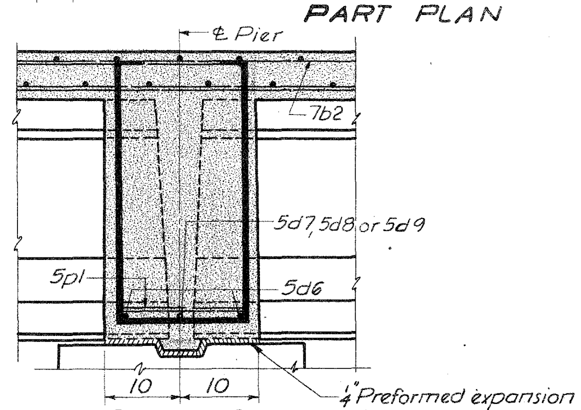
SECTION C-C PIER 2



PART PLAN



ABUTMENT DIAPHRAGM
Section normal to ℄ Abut. Brg.



PIER DIAPHRAGM
Section normal to ℄ Pier.

Design for 5°13' Skew

DUAL 211'-3 × 30' ℄ VARIABLE ROADWAY PRETENSIONED PRESTRESSED CONCRETE BEAM BRIDGES

43'-1½ & 38'-11½ End Spans 2-64'-7 Interior Spans
Concrete Floor & Substructure Tubular Rail

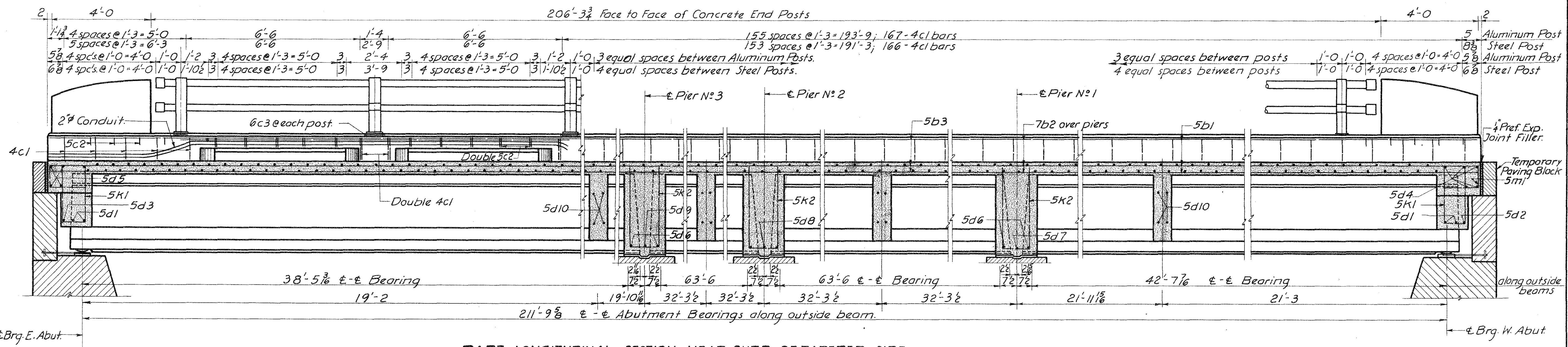
EAST BOUND LANE - SUPERSTRUCTURE DETAILS

Station: 1258+95.48 E.B. Lane Project No FU-1065(10)

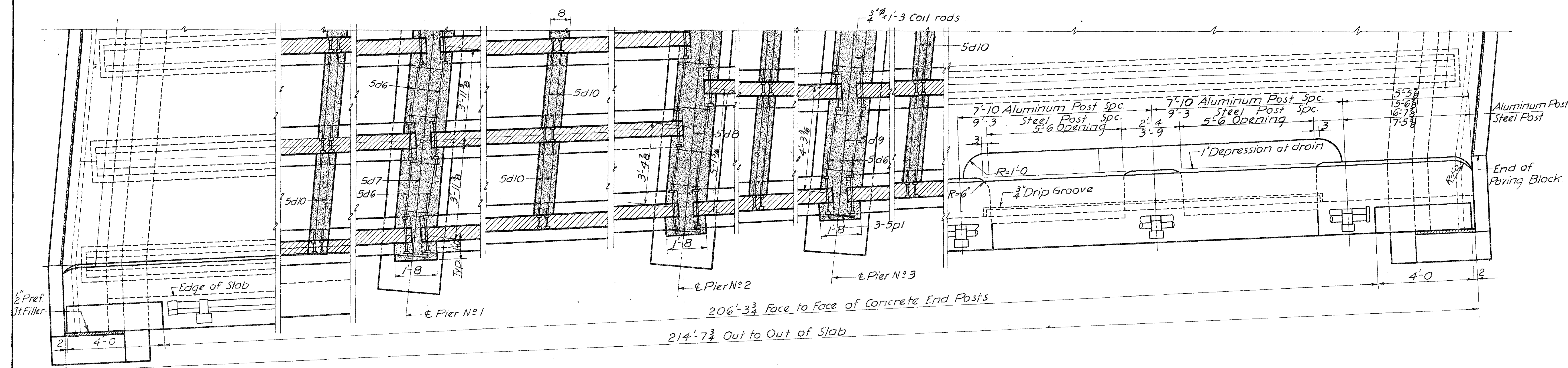
STORY COUNTY

Iowa State Highway Commission
September 1962 Sheet 15 of 23
Design No 3261 Story County File No 21508

Designed by: B.F. Traced by: [illegible] Checked by: R.D.H.

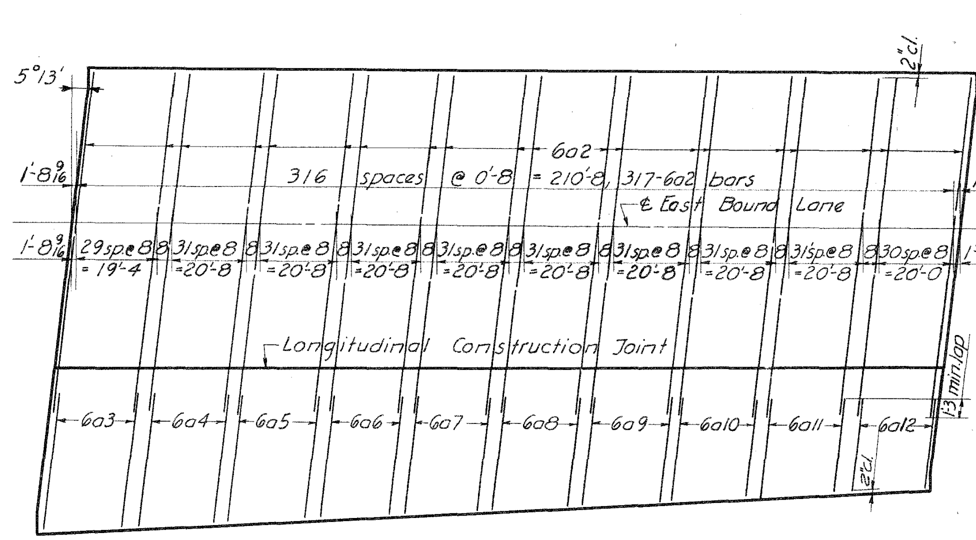


PART LONGITUDINAL SECTION NEAR CURB OF TAPERED SIDE

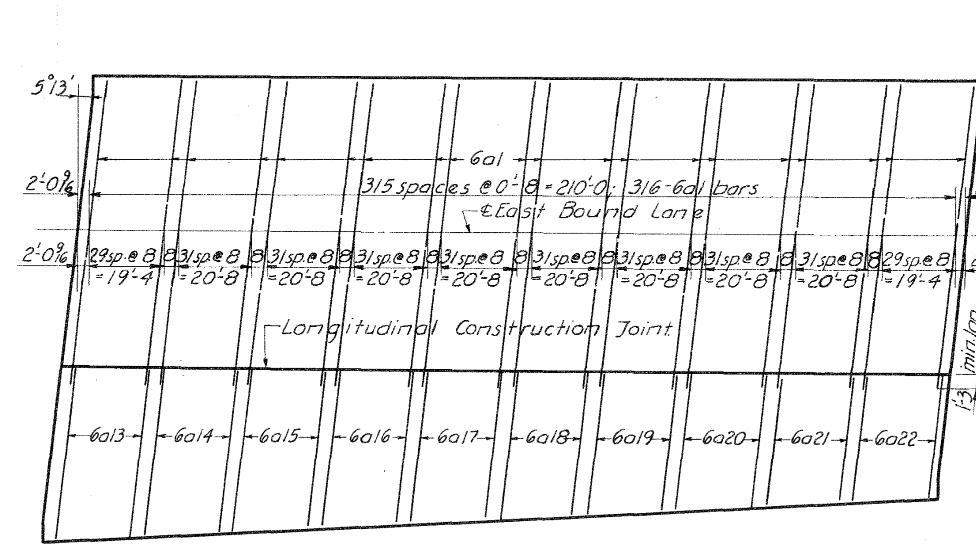


PART PLAN-TAPERED SIDE

Design for 5°13' Skew
DUAL 211'-3 × 30' & VARIABLE ROADWAY PRETENSIONED
PRESTRESSED CONCRETE BEAM BRIDGES
43'-1½ & 38'-11½ End Spans - 2-64'-7 Interior Spans
Concrete Floor & Substructure   Tubular Rail
EAST BOUND LANE - SUPERSTRUCTURE DETAILS
Station: 1258+95.48   Project No FU-1065(10)
STORY COUNTY
Iowa State Highway Commission
September 1962   Sheet 16 of 23
Design No 3261   Story County   File No 21508
Designed by: B.F.   Traced by: ##   Checked by: RDH

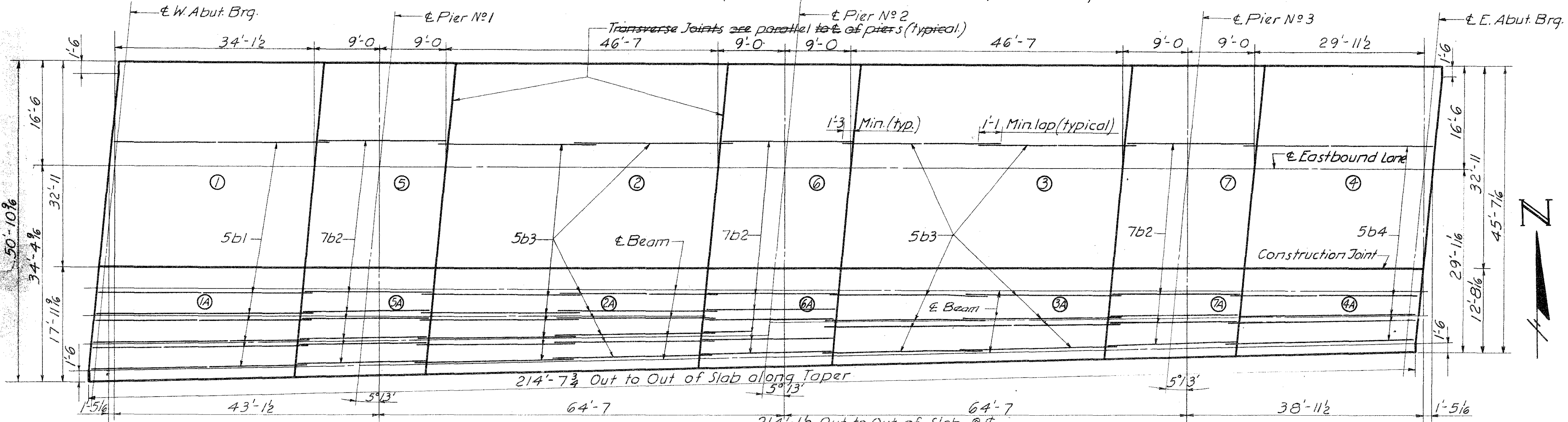


EAST BOUND LANE - BOTTOM TRANSVERSE REINFORCING LAYOUT

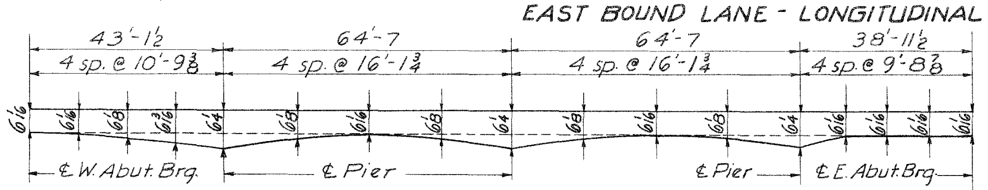


EAST BOUND LANE - TOP TRANSVERSE REINFORCING LAYOUT

Note: ~~Encircled numbers indicate slab placement sequence.~~ Slab was placed continuously. Pier diaphragms ~~are to be~~ were placed with slab ~~sections~~. Curb ~~may be~~ was placed continuously. Alternate procedures for placing concrete ~~may be~~ submitted for approval together with a statement of the proposed method and evidence that the contractor possesses the necessary equipment and facilities to accomplish the required result.



EAST BOUND LANE - LONGITUDINAL REINFORCING LAYOUT & CONCRETE SLAB PLACEMENT



SLAB THICKNESS DIAGRAM

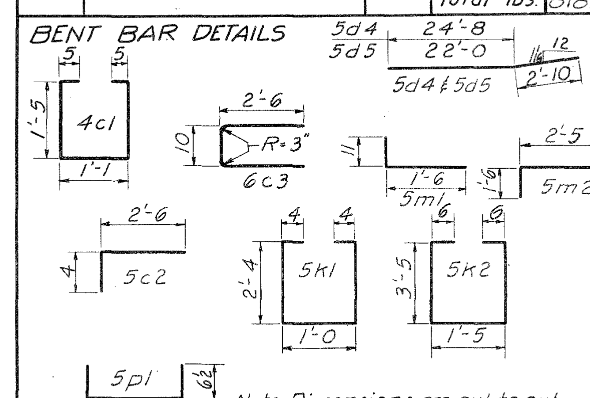
Note: The slab thicknesses shown ~~are~~ were based on the anticipated beam camber remaining after placing the slab and ~~is~~ were not guaranteed for construction. To meet final grade line, slab ~~is to be~~ was thickened to compensate for deficient beam camber and thinned a max. of ⅛" for excess beam camber.

CONCRETE PLACEMENT QUANTITIES	
Item	Amount
Section 1	27.4 c.y.
Section 1A	14.7 "
Section 2	30.5 "
Section 2A	15.1 "
Section 3	30.5 "
Section 3A	13.6 "
Section 4	24.7 "
Section 4A	9.9 "
Section 5	17.0 "
Section 5A	8.7 "
Section 6	17.0 "
Section 6A	7.8 "
Section 7	17.0 "
Section 7A	6.9 "
Curb	43.4 "
End Posts	1.5 "
Total	285.7 c.y.

ESTIMATED QUANTITIES - SUPERSTRUCTURE - E. BOUND LANE		
Item	Unit	Amount
Concrete	c.y.	285.7 ✓
Reinforcing Steel	lb.	82110 ✓
Prestr. Conc. Beam (Special) 38'-4	only	10 ✓
Prestr. Conc. Beam (B1) 42'-6	only	11 ✓
Prestr. Conc. Beam (B6) 63'-4	only	21 ✓
Aluminum Handrail or (℄-℄ End Posts.)	L.F.	407.3 or
~~Steel Handrail (℄-℄ End Posts.)~~	L.F.	~~407.0~~

REINFORCING STEEL - SUPERSTRUCTURE					
Bar	Location	Shape	Nº	Length	Weight
6a1	Slab Transverse Top	—	316	34'-8	16454
6a2	" " Bottom	—	317	37'-2	17696
6a3	" " "	—	30	14'-10	668
6a4	" " "	—	32	14'-4	689
6a5	" " "	—	32	13'-10	665
6a6	" " "	—	32	13'-4	641
6a7	" " "	—	32	12'-10	617
6a8	" " "	—	32	12'-4	593
6a9	" " "	—	32	11'-10	569
6a10	" " "	—	32	11'-4	545
6a11	" " "	—	32	10'-10	521
6a12	" " "	—	31	10'-4	481
6a13	Slab Transverse Top	—	30	17'-0	766
6a14	" " "	—	32	16'-4	785
6a15	" " "	—	32	15'-10	761
6a16	" " "	—	32	15'-4	737
6a17	" " "	—	32	14'-10	713
6a18	" " "	—	32	14'-4	689
6a19	" " "	—	32	13'-10	665
6a20	" " "	—	32	13'-4	641
6a21	" " "	—	32	12'-10	617
6a22	" " "	—	30	12'-4	556
5b1	Slab & Curb Longit. W. End	—	102	36'-7	3892
7b2	" " " " Over Pier	—	333	17'-8	12025
5b3	" " " " Center	—	390	25'-1	10203
5b4	" " " " E. End	—	93	32'-5	3144
4c1	Curb Hoops	▭	336	4'-6	1010
5c2	Curb Transverse	⌐	220	2'-9	631
6c3	Rail Post Anchors	▭	54	5'-6	446
*5d1	Abut. Diaphragm - Horiz.	—	38	4'-3	168
5d2	" " West "	—	2	24'-4	51
5d3	" " East "	—	2	21'-8	45
5d4	" " West "	╲_	10	27'-6	287
5d5	" " East "	╲_	10	24'-10	259
*5d6	Pier Diaphragm Horiz.	—	57	3'-4	198
5d7	" #1 "	—	2	24'-10	52
5d8	" #2 "	—	2	24'-0	50
5d9	" #3 "	—	2	23'-3	48
*5d10	Intermediate Diaphragm	—	152	4'-3	674
5k1	Abut. Diaphragm Hoops	▭	38	6'-0	238
5k2	Pier " "	▭	62	8'-11	577
5m1	Abut. Diaphragm Trans.	⌊	69	2'-4	168
5m2	Curb Transverse End	⌐	16	3'-10	64
5p1	Pier Diaphragm Ties	⊔	74	2'-2	167
4s1	End Post Vert.	—	32	2'-10	61
4t1	" " Horizontal	—	16	3'-6	37
6b5	Curb Longit. @ Single Drain	—	8	8'-0	96
6b6	" " @ Double Drain	—	8	17'-6	210
			Total lbs.		81870

BENT BAR DETAILS



Note: Dimensions are out to out. Radii to ℄ of bar.

* Cut to fit for other than 5'-0 beam spacing.

Design for 5°13' Skew

DUAL 211'-3×30' & VARIABLE ROADWAY PRETENSIONED PRESTRESSED CONCRETE BEAM BRIDGES

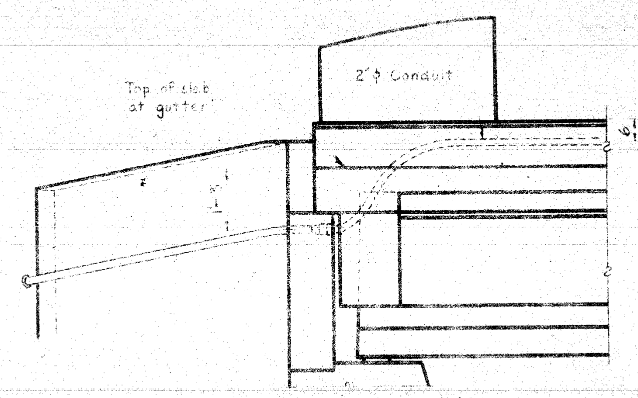
43'-1½ & 38'-11½ End Spans 2-64'-7 Interior Spans
Concrete Floor & Substructure Tubular Rail

EAST BOUND LANE - SUPERSTRUCTURE DETAILS

Station: 1258+95.48 E.B. Lane Project Nº F.U.-1065(10)

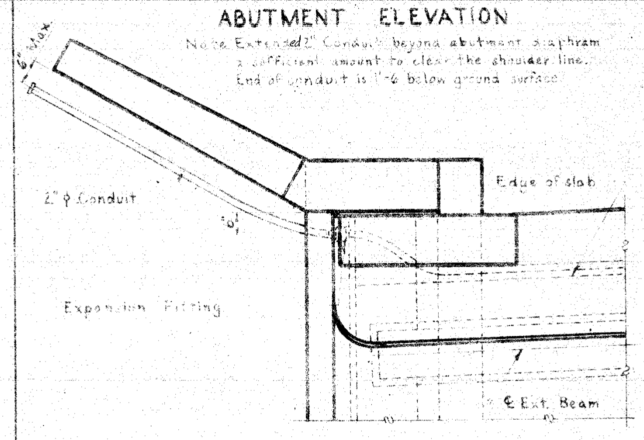
STORY COUNTY

Iowa State Highway Commission
September 1962 Sheet 17 of 23
Design Nº 3261 Story County File Nº 21508

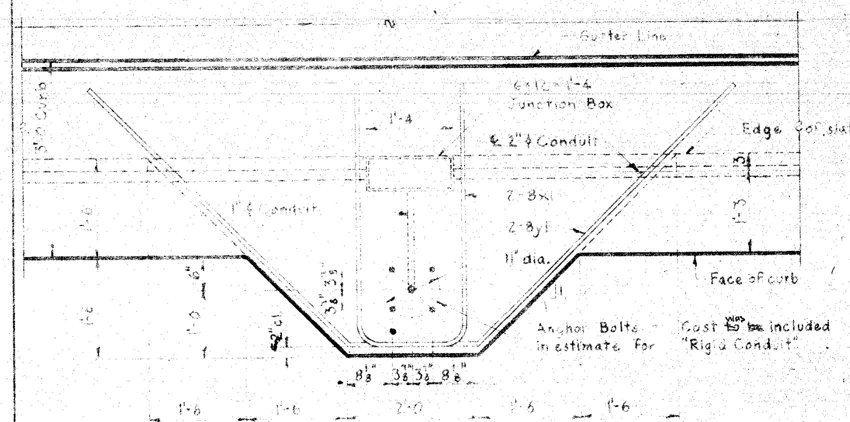


ABUTMENT ELEVATION

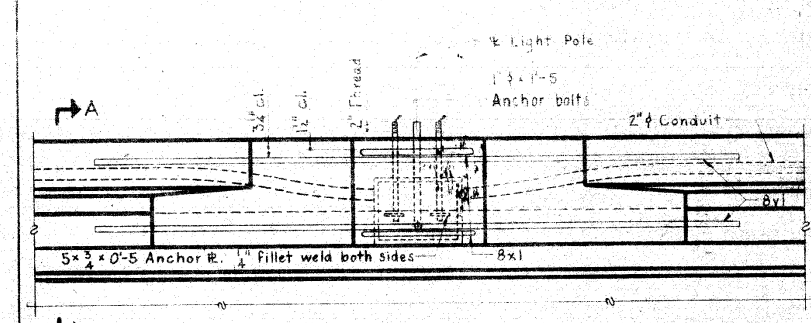
Note: Extend 2" Conduit beyond abutment diaphram a sufficient amount to clear the shoulder line. End of conduit is 1'-6 below ground surface.



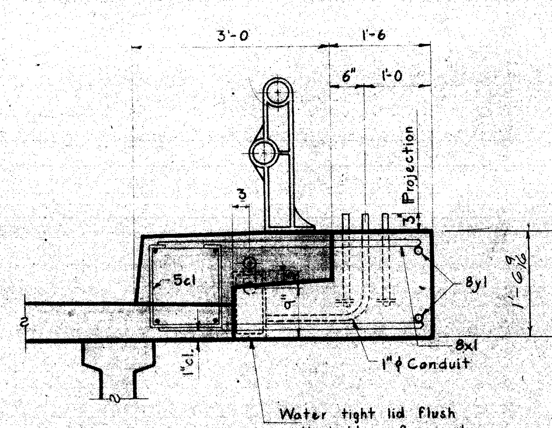
PART PLAN AT ABUTMENT



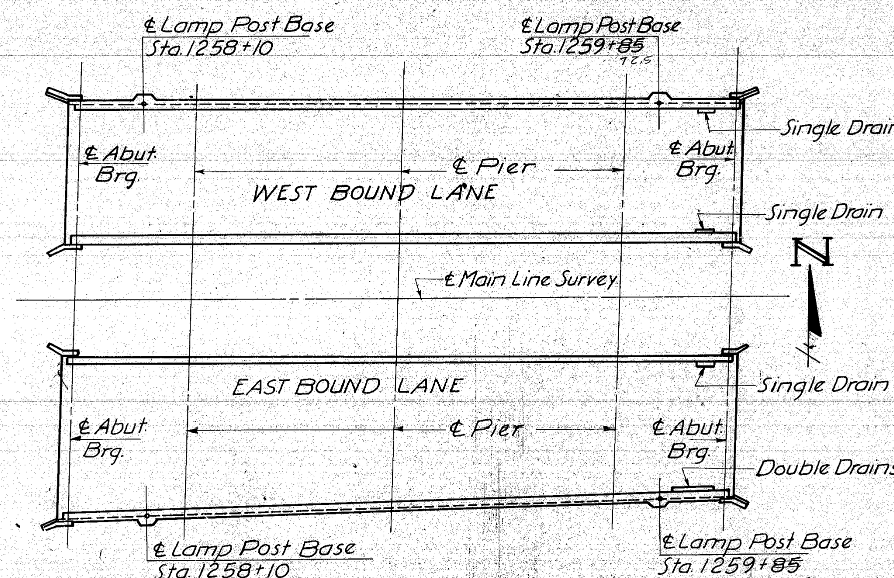
PLAN
(Showing Light Pole Anchor Placement)



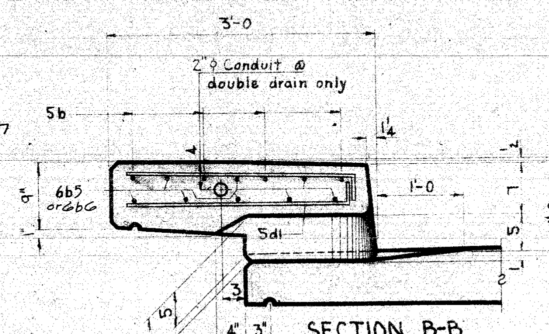
ELEVATION
(Showing Light Pole Anchor Placement)



SECTION A-A



SITUATION PLAN

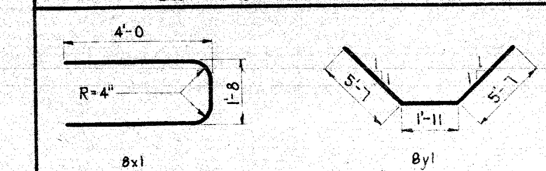


SECTION B-B
With Rail Post removed

REINFORCING STEEL – LAMP POST BASE

Bar	Location	Shape	No.	Length	Weight
8x1	Lamp post base, horizontal		2	9'-3	50
8y1	" " " "		2	13'-1	70
	Total (One lamp post base)				120 lb.

BENT BAR DETAILS



All dimensions are out to out. Radii to ℄ bar.

LIGHTING NOTES:

Construction ~~shall~~ conformed with Iowa Highway Commission Standard Specification for Highway Lighting (Specifications #441).

All Expansion Fittings ~~shall be~~ are 0-Z Expansion Fitting Type A × 200 ~~or an approved equal.~~

All exposed conduit ends ~~are to be~~ were capped to exclude dirt and moisture.

Specifications for Rigid Steel Conduit and Junction Boxes is Specification #441 (Specifications for Highway Lighting) articles 2518.11 and 2518.13 respectively.

The contract unit price per linear foot of conduit ~~shall be~~ was full compensation for furnishing all material (including junction boxes, fittings, and anchor bolts), labor and any work incidental to the installation. The concrete and the weight of reinforcing steel ~~is~~ was included in the Superstructure Estimated Quantities.

The length of conduit installed ~~shall be~~ was measured in feet by the Engineer.

Cost of finishing and installing poles, lights, lighting conductor ~~is~~ was not a part of this estimate.

ESTIMATED QUANT. – 4 LAMP POST BASES

2" ϕ Rigid Steel Conduit	450 LF ✓
1" ϕ Rigid Steel Conduit	12 LF ✓

Design for 5°13' Skew

DUAL 211'-3 × 30' & VARIABLE ROADWAY PRETENSIONED PRESTRESSED CONCRETE BEAM BRIDGES

43'-1½ & 38'-11½ End Spans 2-64'-7 Intermediate Spans

Concrete Floor & Substructure Tubular Rail

FLOOR DRAIN & LIGHTING DETAILS

Station 1258+95.48 E.B. Lane Project No. F.U.-1065(10)

Station 1259+02.23 W.B. Lane

STORY COUNTY

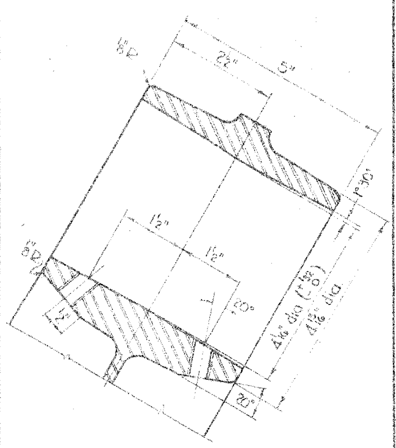
IOWA STATE HIGHWAY COMMISSION

September 1962 Sheet 18 of 23

Design No. 3261 Story County File No. 21508

Designed by B.F. Traced by F.G. Checked by R.O.U.

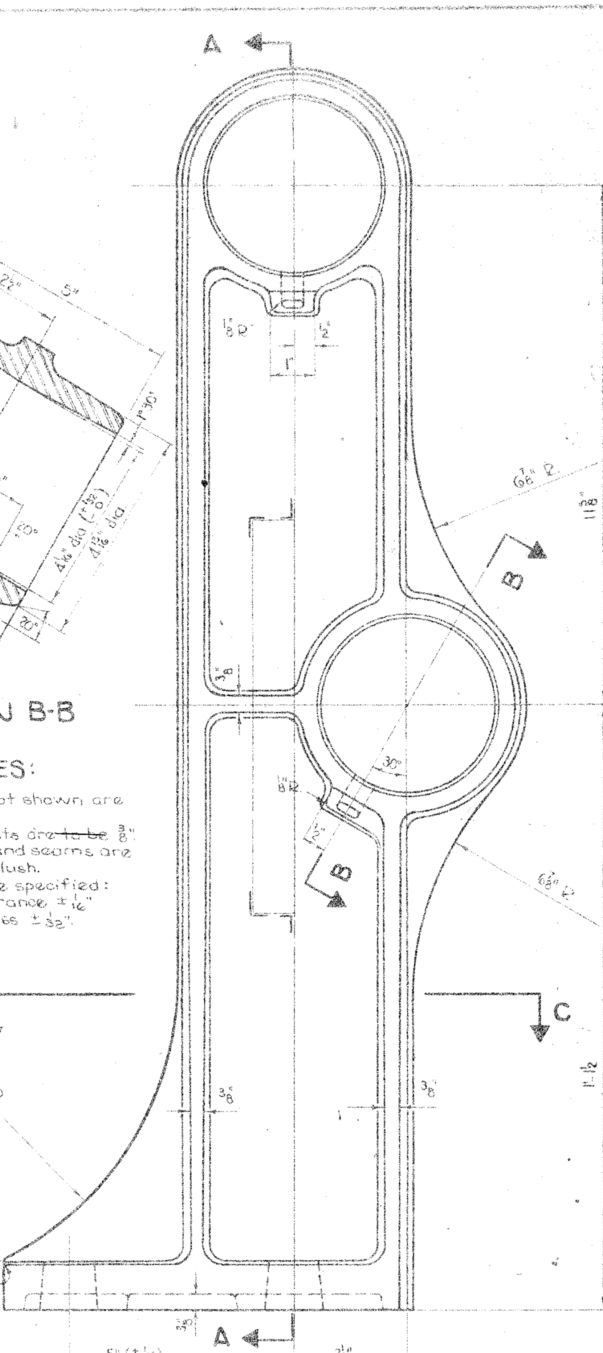
NOTE: Top and bottom rail to be spliced in different rail panels.

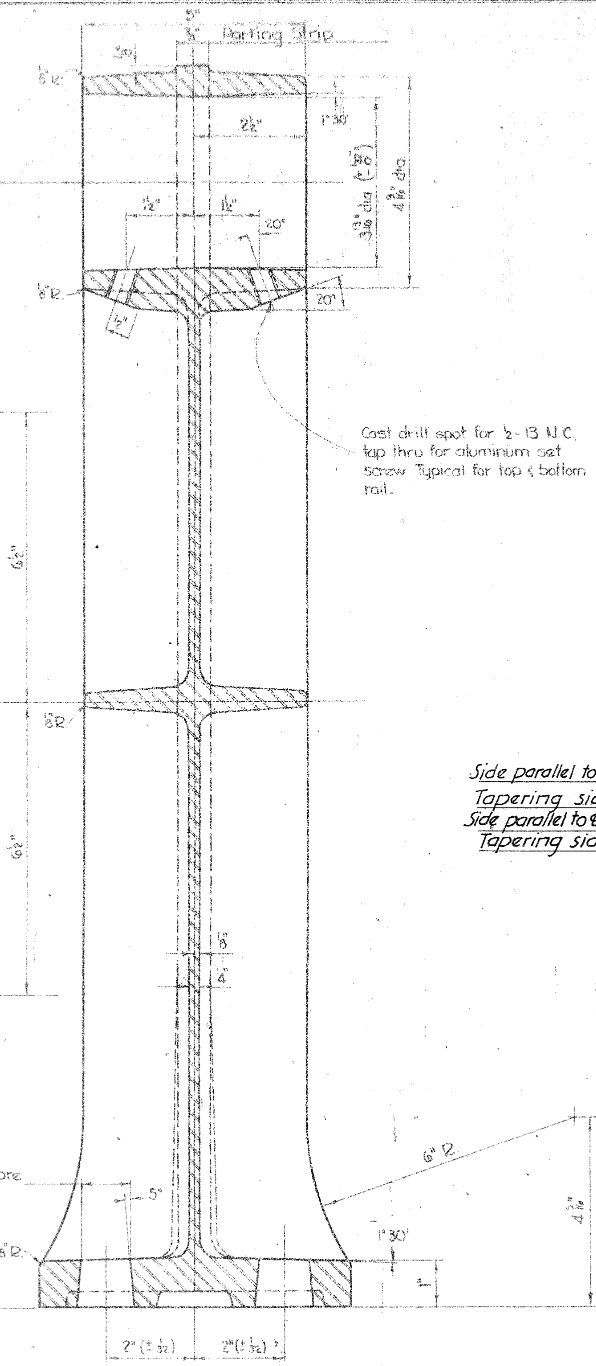


PART SECTION B-B

CASTING NOTES:

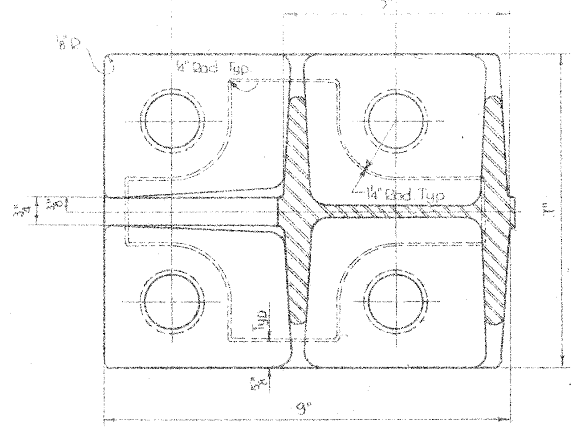
1. All draft angles not shown are ~~to be~~ 3°.
2. All unmarked fillets are ~~to be~~ ⅛".
3. All gates, risers and seams are ~~to be~~ trimmed flush.
4. Unless otherwise specified:
   Casting tolerance ± 1/16"
   Wall thickness ± 1/32"



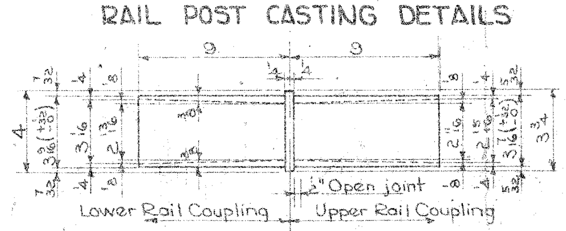


SECTION A-A

RAIL POST CASTING DETAILS

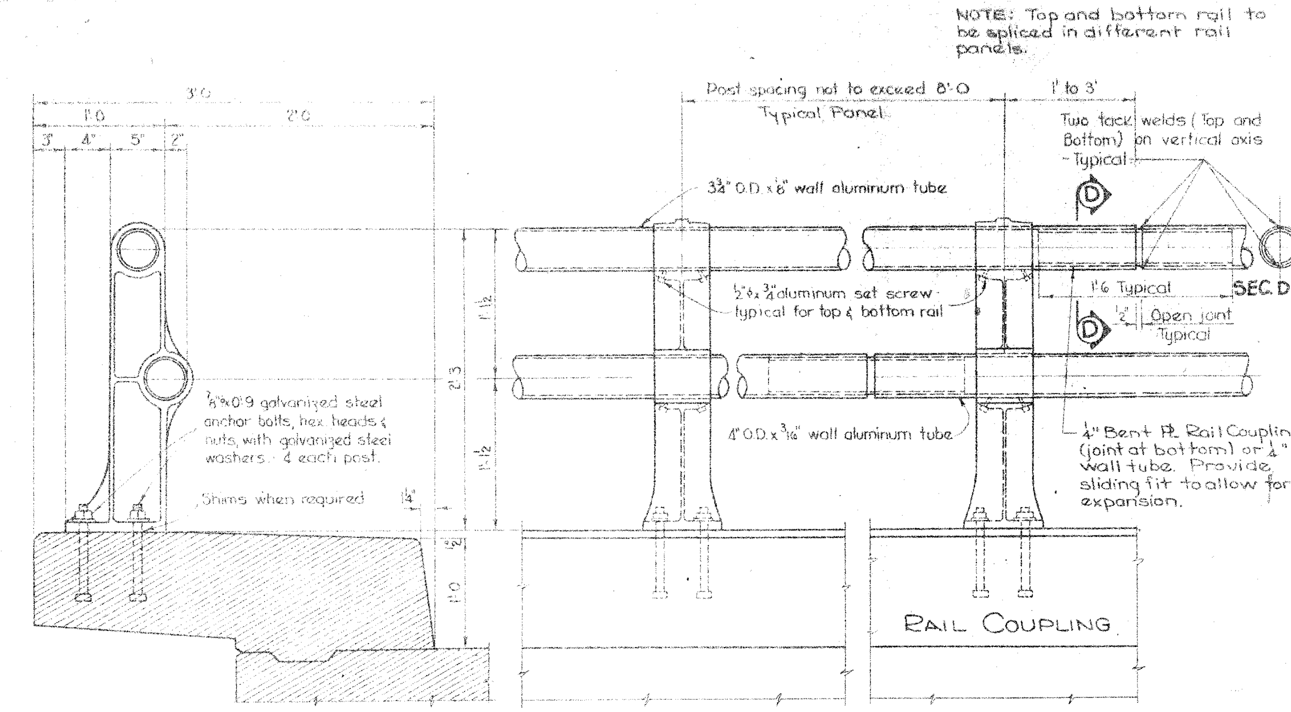


SECTION C-C



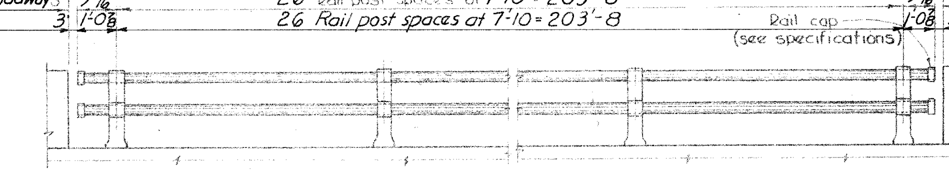
DETAIL OF CASTING FOR ALTERNATE RAIL COUPLING

Revised 6-27-61 Rails made continuous through three posts.
Revised 7-8-60 Post casting material and railing splice details changed
Revised 8-6-59 Alternate materials for Rail Caps added (Specs.: Par. 2A Item 2)
Revised 12-10-58 Post casting finish changed (Specifications: Par. 2B Item 4)
Revised 10-6-58 Post casting base dished out and other minor changes.

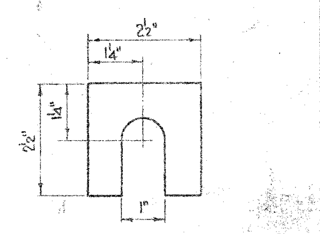


SECTION THRU CURB

Side parallel to ℄ Roadway	205'-9⅜ Face to Face of Concrete End Posts
Tapering side	206'-3¾ face to face of concrete end posts
Side parallel to ℄ Roadway	9 9/16 — 26 Rail post spaces at 7'-10 = 203'-8 — 9 9/16
Tapering side	1'-0⅛ — 26 Rail post spaces at 7'-10 = 203'-8 — 1'-0⅛



RAIL POST LAYOUT



ALUMINUM SHIM DETAIL

Note: Provide 4-1/16" thick shims at each post

SPECIFICATIONS:

1. DESCRIPTION OF BID ITEM
   A. Aluminum handrail ~~is to~~ was be bid on a linear foot basis measured from center to center of end posts. The price bid for "Aluminum Handrail" ~~shall~~ consisted of furnishing, fabricating, erecting, and cleaning all metal handrail and ~~shall~~ included the furnishing and installation of anchor bolts and all other incidental items in accordance with these plans and specifications.

2. COMPONENT PARTS AND MATERIALS
   A. Aluminum Bridge Rail Tubing
      1. Aluminum tubing ~~shall comply~~ complied with the A.S.T.M. Specification B235-* alloy GS11A condition T6 (commercial designation 6061-T6). The rail tubing ~~is to be~~ was fabricated from random length tubing and joined as indicated. Each rail section ~~must pass~~ passes thru at least three posts before being spliced, for as many rail sections as possible.
      2. The aluminum rail tubing ~~shall be~~ was closed at the ends next to the concrete end post, as detailed, by means of cast caps or plugs or by means of welded end plates. The cast caps or plugs ~~shall comply~~ complied with the material specifications as outlined for post castings or with A.S.T.M. Specification B108 or B26 alloy S5A (AA Alloy 43) condition F.
   B. Aluminum Castings For Rail Posts, End Caps And Rail Couplings
      1. Aluminum castings ~~shall comply~~ complied with the Iowa State Highway Commission Supplemental Specifications for "Aluminum Rail Posts And Cast End Caps" dated May 22, 1962.
      2. Before setting posts, the entire base of the post casting ~~shall be~~ was coated with an aluminum impregnated caulking compound ⅛" thick. The caulking compound ~~shall comply~~ complied with Federal Specifications TT-C-598 for knife grade to which ~~shall be~~ was added aluminum paste complying with Paragraph 4181.02 in proportion to one pound of aluminum to 5 pound of caulking compound.
   C. Aluminum Set Screws for Posts
      1. Aluminum set screws ~~shall comply~~ complied with the A.S.T.M. Specification B211 * alloy CG 42 A (commercial designation 2024-T4 with No. 205 alumilite finish). The finished set screws ~~shall be~~ were supplied in the T-4 temper and ~~shall be~~ were given an anodic coating at least 0.0002" in thickness and chromate sealed. The set screws ~~shall~~ have a hexagon socket head and oval point.
   D. Aluminum Shims
      1. Aluminum shims ~~shall comply~~ complied with the A.S.T.M. Specification B-209 * alloy 990A condition O (commercial designation 1100-O).

   * Current tentative A.S.T.M. Standard Specifications.

3. CONSTRUCTION
   A. The specifications for construction ~~shall be~~ the Standard Specifications of the Iowa State Highway Commission, Series of 1960, plus current Special Provisions and current Supplemental Specifications with these added provisions:
      1. The anchor bolts for the aluminum posts ~~shall be~~ were set at the line and elevations shown on the plans. They ~~shall be~~ were firmly held in place by suitable templates that will assured their correct position during the placement of concrete. Aluminum shims, ~~as~~ detailed, ~~shall be~~ were used if necessary to insure the correct elevation of the rails.
      2. The cast aluminum posts and the aluminum tube rails ~~shall be~~ were carefully handled during their unloading, handling, and erection. ~~Members that are marred, disfigured or damaged to the extent that they impair their usefulness or appearance shall be rejected and replaced at the contractor's expense.~~
      3. The aluminum handrail ~~shall be~~ was stored above ground upon suitable platforms and kept free from dirt, grease, and contact with dissimilar metals. The stored aluminum handrail ~~shall be~~ was protected from moisture as far as practical.
      4. After anchor bolts have been tightened, the excess caulking compound ~~shall be~~ was removed and all openings around the base of the post painted full and flush with caulking compound.
      5. After erection, rails and posts and the concrete around the post bases ~~shall be~~ were thoroughly cleaned of all dirt, grease, caulking compound and other foreign material by an approved means as directed by the Engineer.
      6. Set screws ~~are to be~~ were tightened to prevent rails from rattling, but they ~~are~~ were not ~~to be~~ tightened so as to prevent movement due to rail expansion.

ALUMINUM HANDRAIL QUANTITIES	
Aluminum Handrail (℄-℄ End Posts)	407.3 lin. ft.

Design for 5°13' Skew

DUAL 211'-3 x 30' & VARIABLE ROADWAY PRETENSIONED PRESTRESSED CONCRETE BEAM BRIDGES

43'-1½ & 38'-11½ End Spans — 2-64'-7 Interior Spans

Concrete Floor & Substructure — Tubular Rail

ALUMINUM HANDRAIL DETAILS

Station 1258+95.48 East Bound Lane — Project No. FU-1065(10)

STORY COUNTY

Iowa State Highway Commission

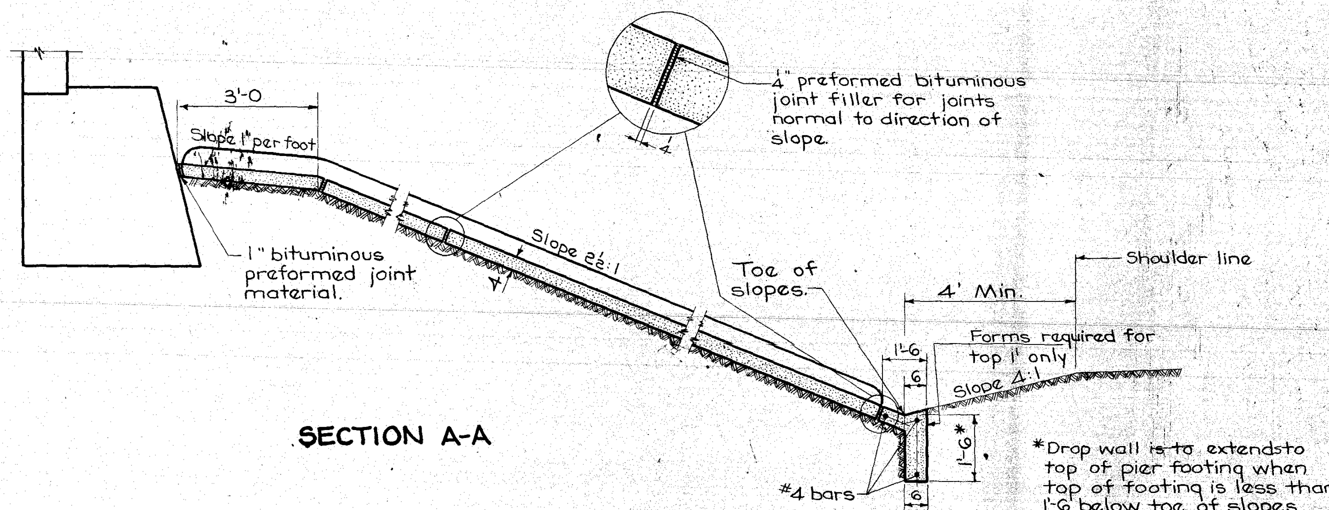
September 1962 — Rail Standard Sheet 1000 — Sheet 19 of 23

Design No. 3261 — Story County — File No. 21508

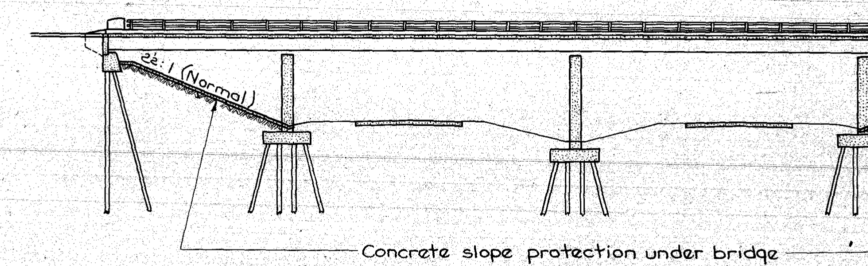
Designed by: B.F — Checked by: RDU

1000

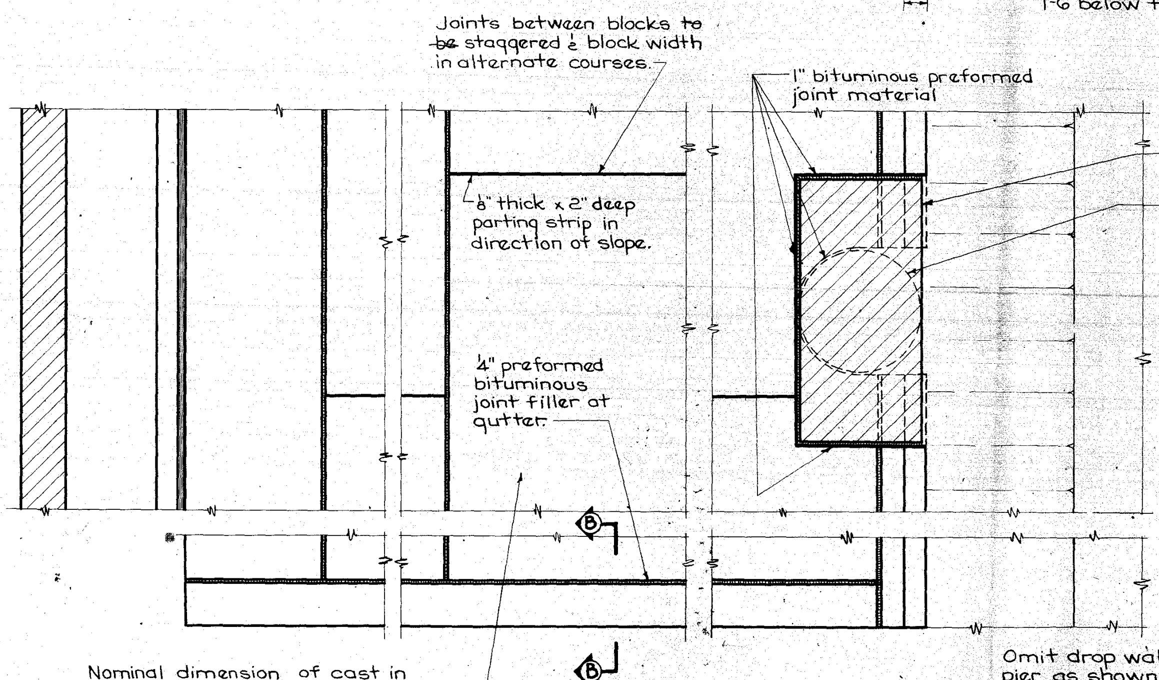
Revised 1-3-62: Specifications changed.
Revised 5-4-62: Cast coupling added and location of couplings changed.

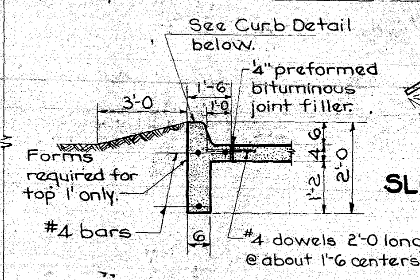


SECTION A-A

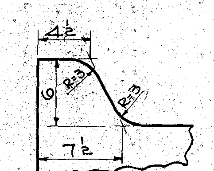


LONGITUDINAL SECTION ALONG ℄ OF ROADWAY

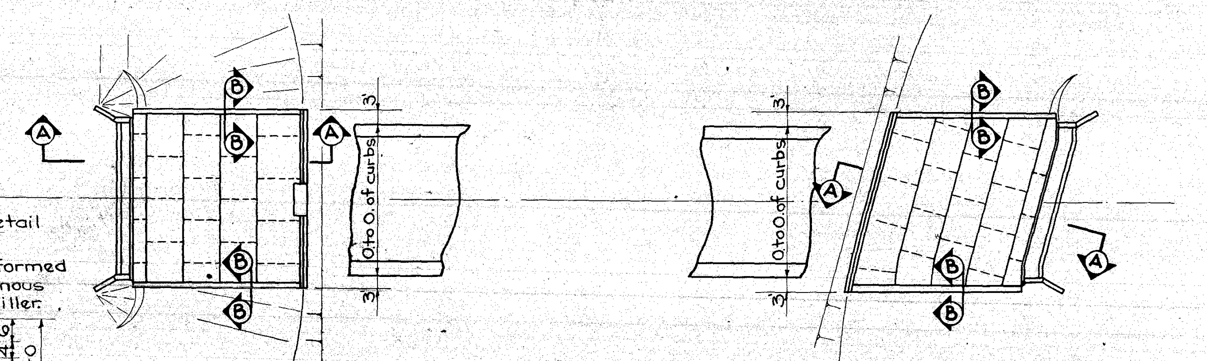




SECTION B-B

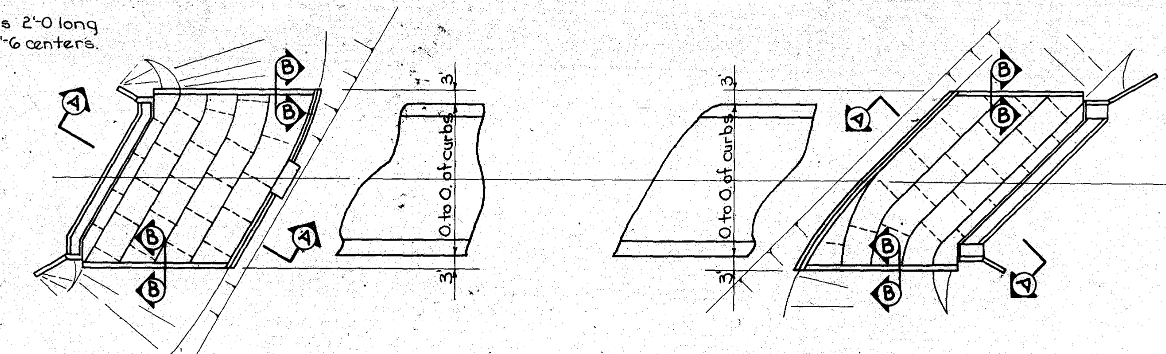


CURB DETAIL



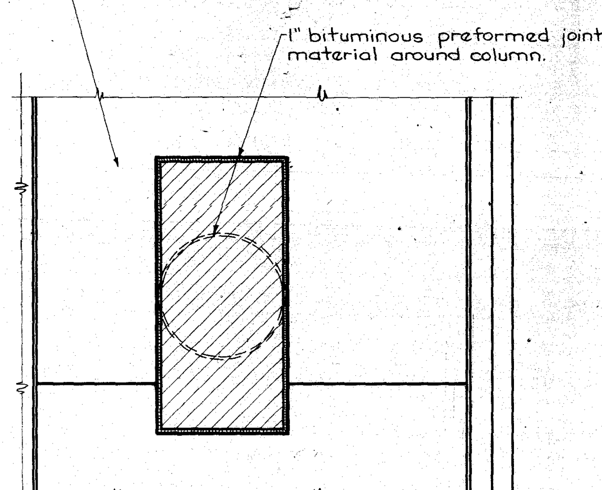
SLOPE PROTECTION LAYOUT 0° SKEW

SLOPE PROTECTION LAYOUT 15° SKEW



SLOPE PROTECTION LAYOUT 30° SKEW

SLOPE PROTECTION LAYOUT 45° SKEW



PART SLOPE PROTECTION PLAN (0° SKEW)
FOR COLUMNS IN SLOPE

Scale: ½" = 1'-0

GENERAL NOTES:

This sheet shows details for plac~~ing~~ed portland cement concrete slope protection under overhead structures.

The current specifications of the Iowa Highway Commission ~~shall~~ apply with modifications or additions listed below:

Concrete - Class S Structural.

Finish - Class 1, Floated Surface Finish.
Cure - No cure necessary.
Subgrade Preparation - The subgrade is ~~to be~~ shaped and compacted so that finished slope protection ~~will be~~ is similar to examples shown on this sheet. The subgrade ~~shall be~~ WAS firm when concrete ~~is~~ WAS placed. Sprinkling required ~~shall be~~ WAS done early enough so that concrete ~~is~~ WAS not placed on a muddy subgrade. No subgrade paper ~~will be~~ WAS required.

The cast in place concrete ~~is to be~~ WAS poured in approximately 10' wide courses, but all courses on one slope should have approximately equal widths. Adjacent courses ~~shall~~ WERE not ~~be~~ poured within 15 hours of one another. The joints in the direction of the slope ~~are to be~~ WERE staggered about ½ block width.

Basis of payment: Payment ~~will be~~ WAS made on a square yard basis for slope protection constructed. The unit price bid per square yard ~~is to~~ included costs of all materials and labor required to construct this protection as shown or intended by these plans. The subgrade preparation including any necessary excavation or filling required to shape the slope to the lines shown on the plans and disposal of excess earth excavated as directed by the Engineer, ~~are~~ WERE considered incidental to placing the concrete slope protection.

Where erosion control work ~~is~~ WAS completed the Contractor ~~shall be~~ responsible for any plant materials destroyed adjacent to slope protection area. The Contractor ~~shall~~ replant~~s~~ reseeded and re mulched all areas disturbed adjacent to slope protection areas in accordance with section 2601 of Standard Specifications, Series of 1960, at his expense.

SLOPE PROTECTION QUANTITIES		
West Slope Protection	West Bound	~~194~~ Sq.Yd 218.8
East Slope Protection	West Bound	~~185~~ " " 196.5
West Slope Protection	East Bound	~~271~~ " " 311.8
East Slope Protection	East Bound	~~244~~ " " 258.1
		985.2
	Total	~~894~~ Sq.Yd.

Revised 1-19-61 Curb dowel bars added.
Revised 7-21-60 Corrected for 1960 Standard Specifications.
Revised 2-15-60 Precast block construction deleted. Curb added to sides.
Revised 9-15-59 Statement concerning erosion control added.
Revised 9-4-59 Statement concerning disposal of excess earth added.

Design For
CONCRETE SLOPE PROTECTION
STORY COUNTY
Project No. F.U.-1065(10)
IOWA STATE HIGHWAY COMMISSION
September 1962
Sheet 23 of 23

Design No. 3261 Story County File No. 21508

Designed by B.F. Traced by (illegible) Checked by RDU

F

APPENDIX C: INSPECTION SCETCHES

Form 810040
6-77

Scale	Bridge No. 8548.4R030	Sketch by	Date	Page
	Sketch of: Legends	TEAM #1	9/20/82	B-1
		TEAM #1	10/13/86	
		TEAM # 1	8-13-90	
		TEAM # 1	8-17-94	
		TEAM #1	6-4-96	
		Team #1	10-21-02	
		Team 1	3-5-14	

Ø = FROST DETECTION DEVICE (SPAN #1 ONLY)

Scaling

Hollow

Spalled

Leaching

Stalactite

Stain

Map Cracking

Reinf. Steel

Cracks Hairline or Noted

C.P. CONCRETE PATCH

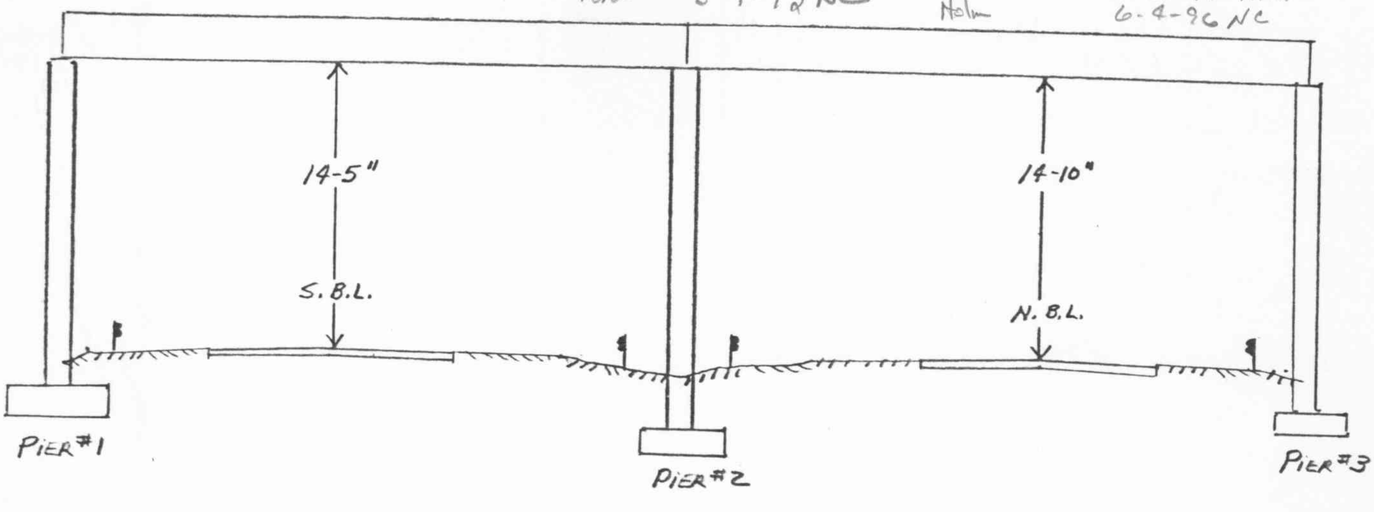
A.C. PATCH

Form 810040
6-77

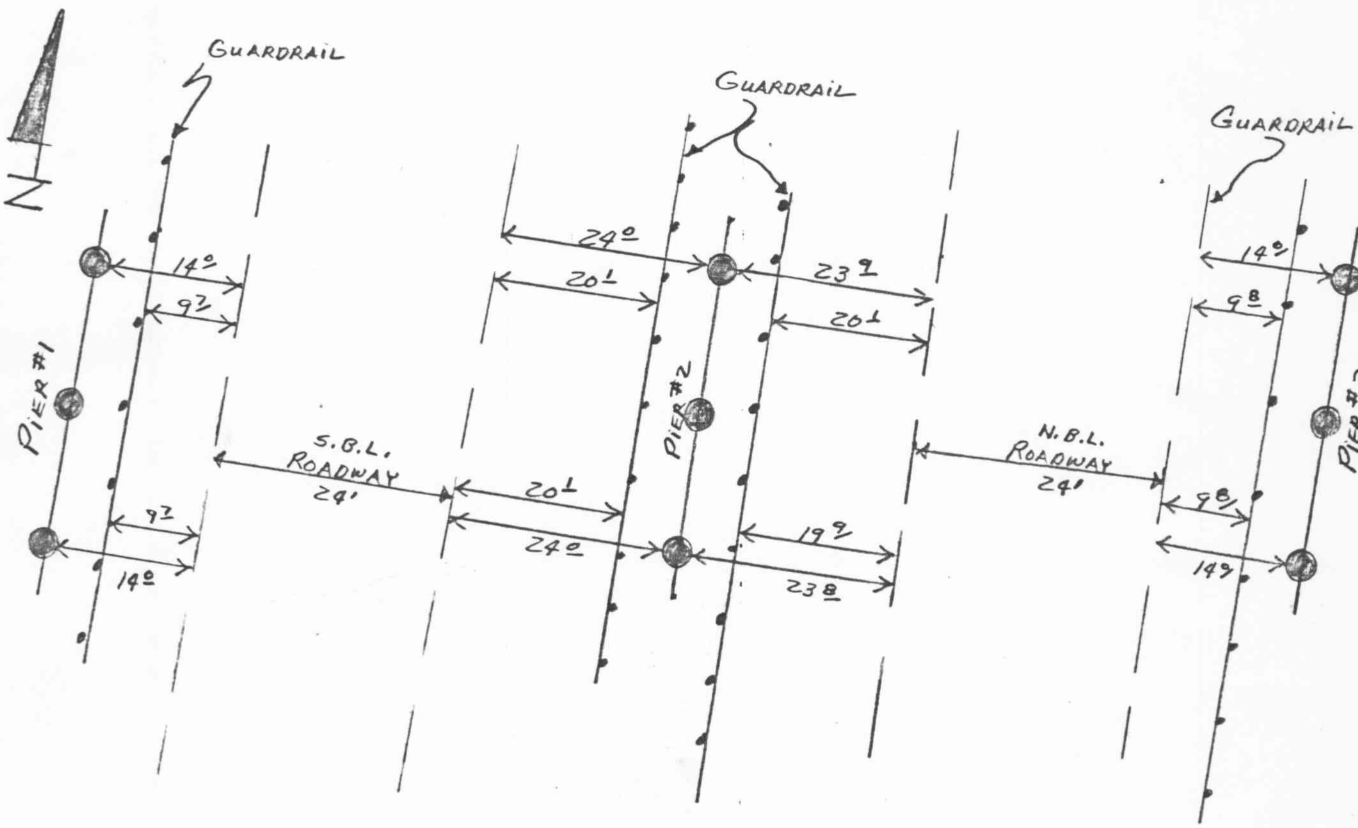
Scale	Bridge No. 8548.4 R 030	Sketch by	Date	Page
	Sketch of: VERTICAL & HORIZONTAL CLEARANCE	Boyo	N.C. 6-21-84	~~B-1 A~~
		D.G.B.	N.C. 10/13/86	B-2

Bun 3-5-14 NC
Holm 10-21-02 NC
Bun 1-13-05 NC
RRo 3-10-10 NC
RRo 3-1-12 NC

Boyo 8-13-90 N.C.
D.G.B. 8-17-94 N.C.
Holm 6-4-96 NC



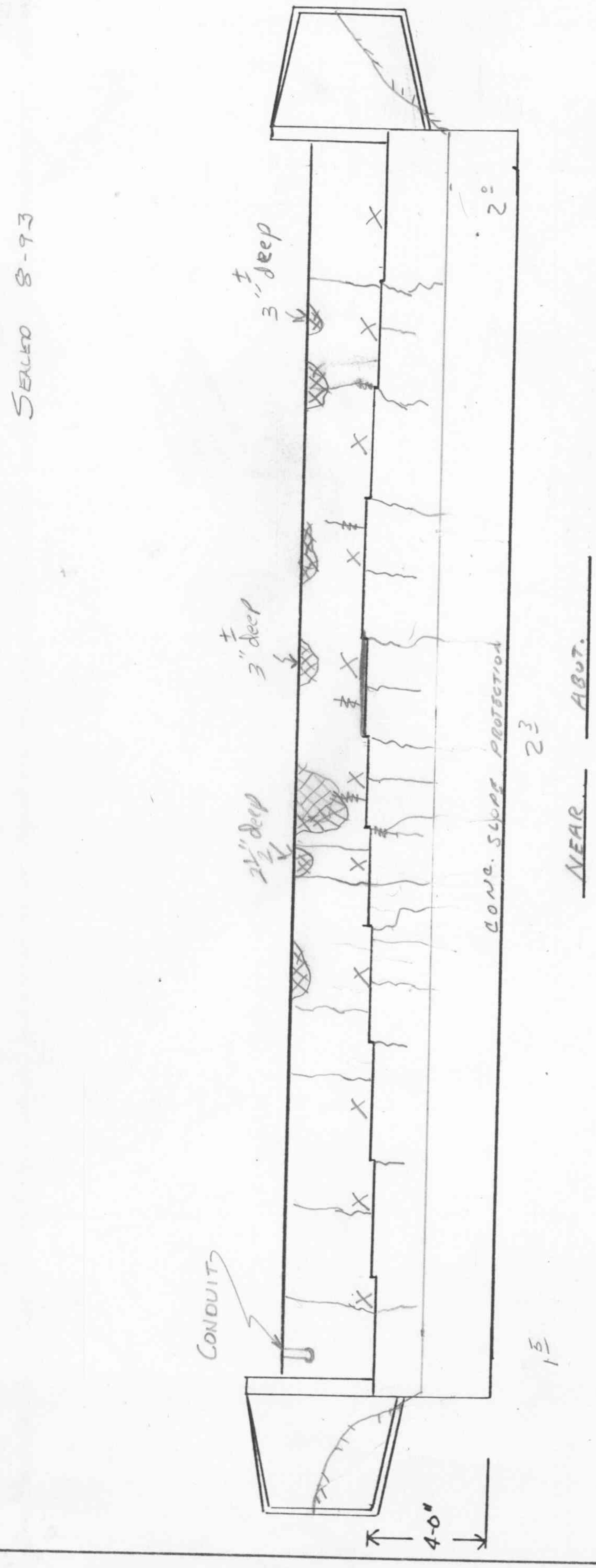
RT. PROFILE



Form 810040
6-77

Scale	Bridge No. 8548.4 R 030	Sketch by	Date	Page
	Sketch of: NEAR ABUTMENT	K.L.H	HAIRLINE CRACKS 6-21-84	~~B-2~~
		A.A.R.	NO CHANGE 10-13-86	B-3

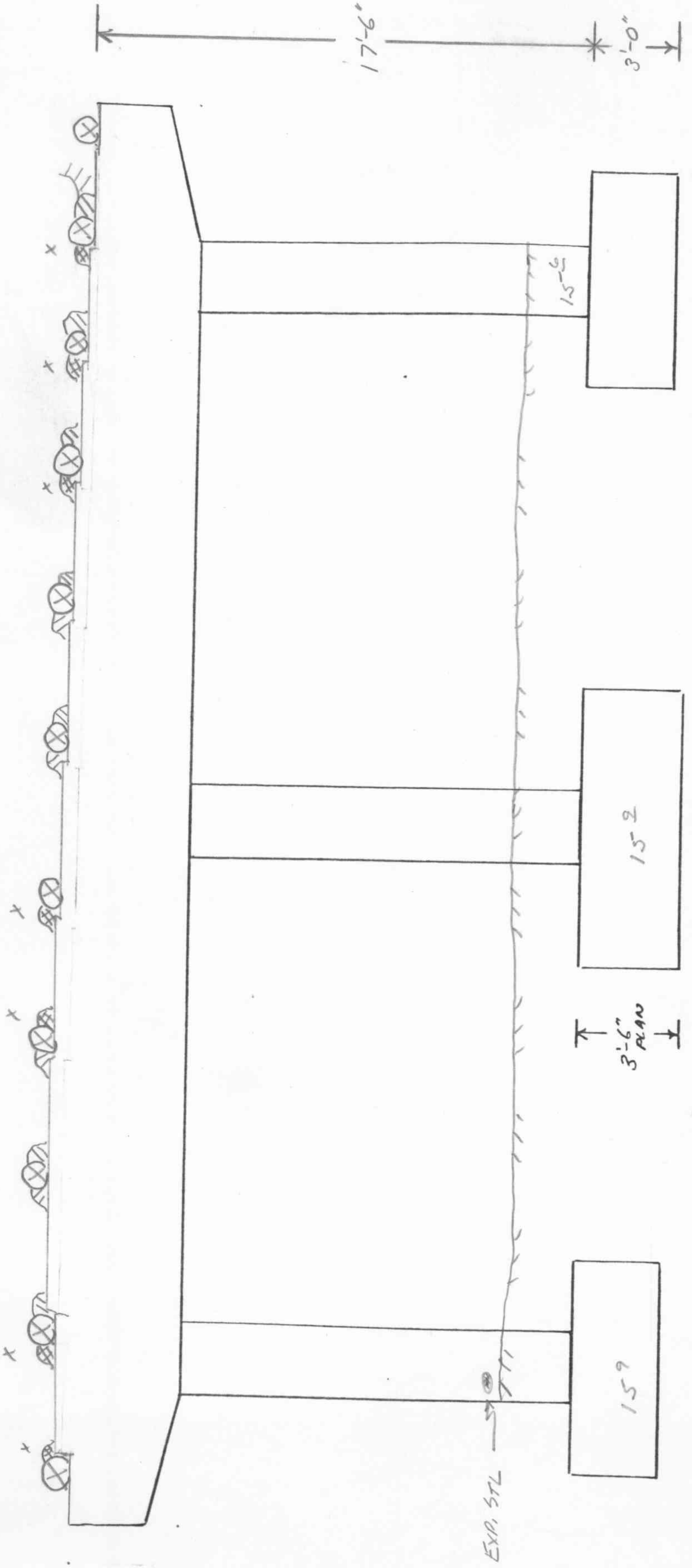
Boyd	8-13-90	N.C.
D.G.B.	8-17-94	SPALL
Holm	6-4-96	No Change
Bun	10-21-02	M.N
Bun	1-13-05	spalls
Rks	3-10-10	NC
Rks	3-1-12	NC
FA	03/05/14	NC



Form 810040
7-83

Scale	Bridge No. 8548.4 R 030	Sketch by	Date	Page
60	Sketch of: PIER # 1 - NEAR FACE	K.L.H	6-21-84	~~B-3~~
		A. A. R.	MINOR 10-13-86	B-4
		BOYO	N.C. 8-13-90	

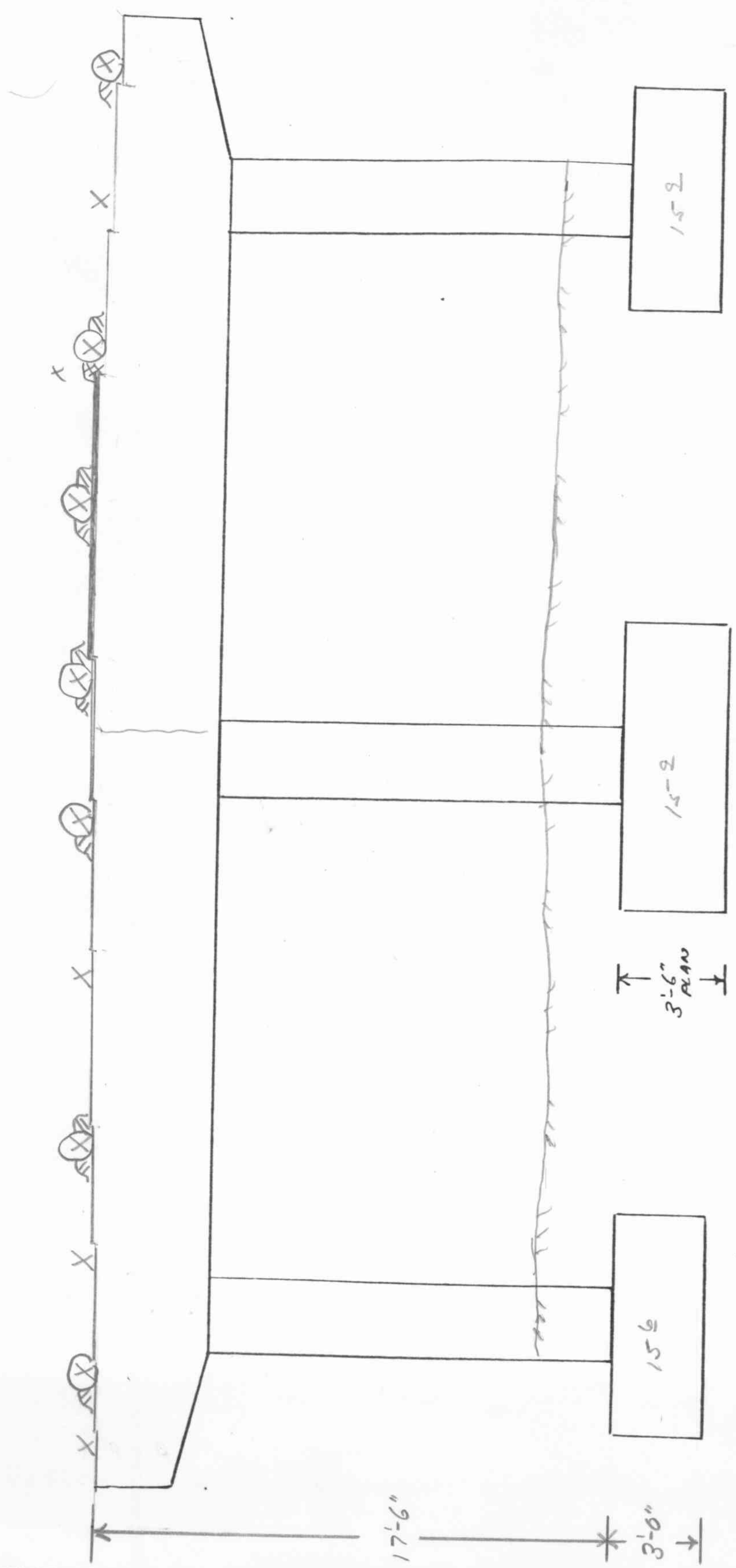
D.G.B. 8-17-94 N.C.
Holm 6-4-96 NC
Bun 10-21-02
Bun 1-13-05 N.C
Rko 3-10-10 NC
Rko 3-1-12 MN
[initials] 03/05/14 NC



Form 810040
7-83

Scale	Bridge No. 8548.4 R 030
60	Sketch of: PIER # 1 - FAR FACE

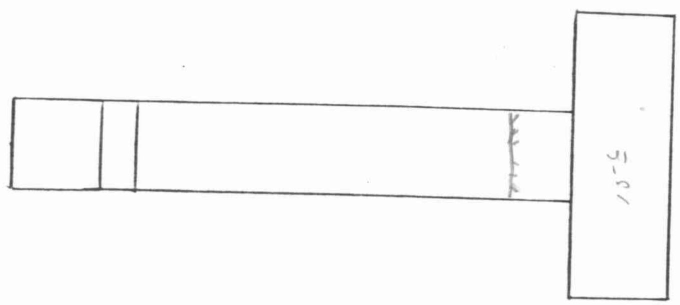
Sketch by	Date	Page
K.L.H.	6-21-84	~~B-4~~
A.A.R.	NO CHANGE 10-13-86	B-5
Borg	N.C. 8-13-90	
D.G.B.	8-17-94 MINOR	
Holm	6-4-96 NC	
Bun	10-21-02 N.C	
Bun	1-13-05 N.C	
Rks	3-10-10 NC	
Rks	3-1-12 MN	
FA	03/05/14 NC	



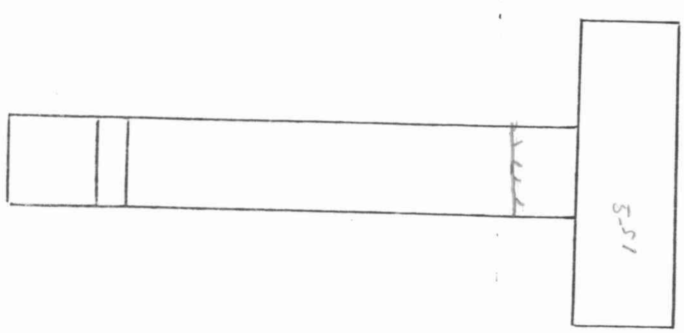
Form 810040
7-83

Scale	Bridge No. 85 48.4 R 030
60	Sketch of: PIER # 1 — RT. & LT. END

Sketch by	Date	Page
K.L.H.	6-21-84	~~B-5~~
A.A.R.	NO CHANGE 10-13-86	B-6
BO40	N.C. 8-13-90	
D.G.B.	8-17-94 N.C.	
Holm	6-4-96 NC	
Bun	10-21-02 N.C.	
Bun	1-13-05 N.C.	
Rks	3-10-10 NC	
Rks	3-1-12 NC	
FA	03/05/14 NC	



RT. END

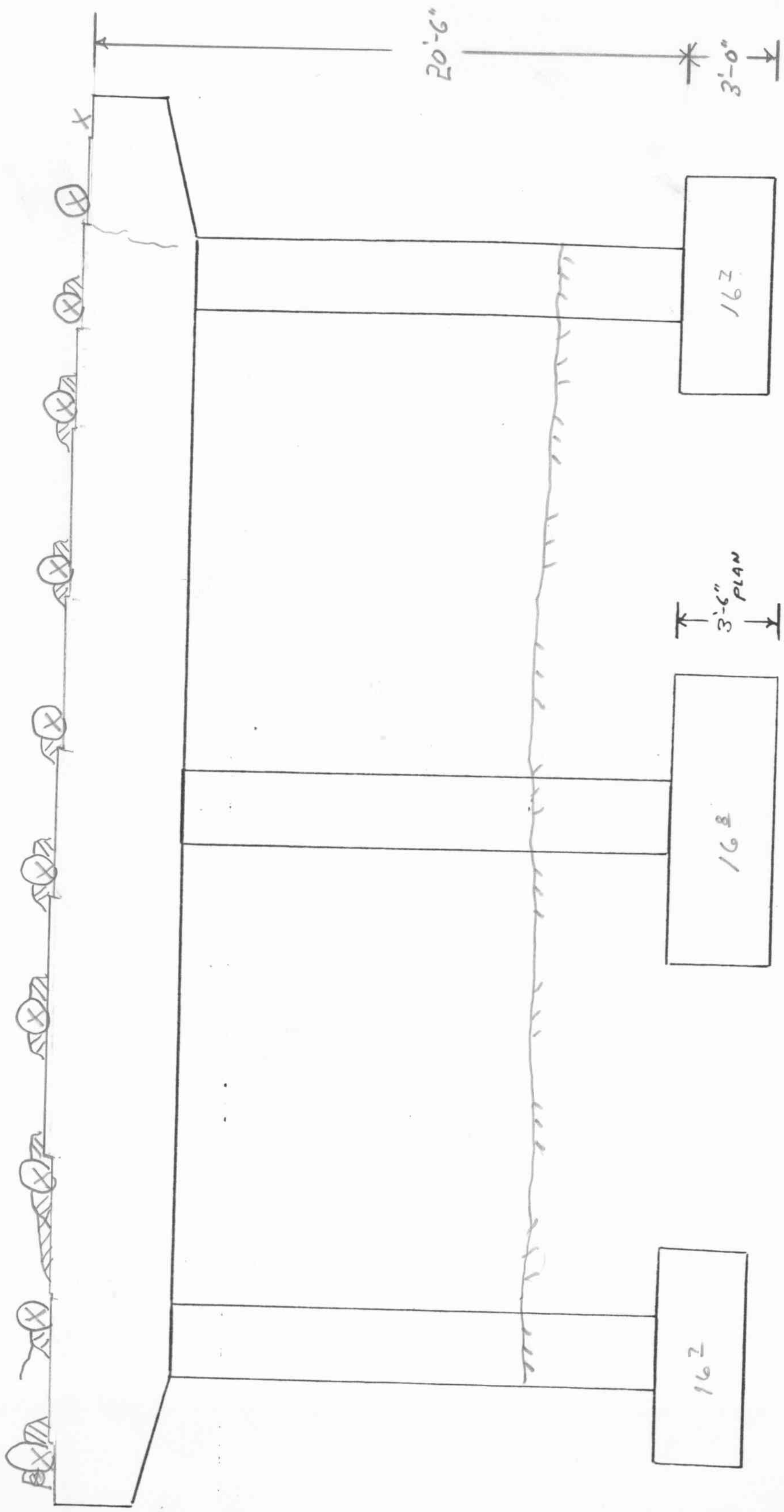


LT. END

Form 810040
7-83

Scale	Bridge No. 8548.4 R 030	Sketch by	Date	Page
60	Sketch of: PIER # 2 - NEAR FACE	K.L.H.	6-21-84	~~8-6~~
		A.A.R.	NO CHANGE 10-13-86	8-7
		Boyd	N.C. 8-13-90	

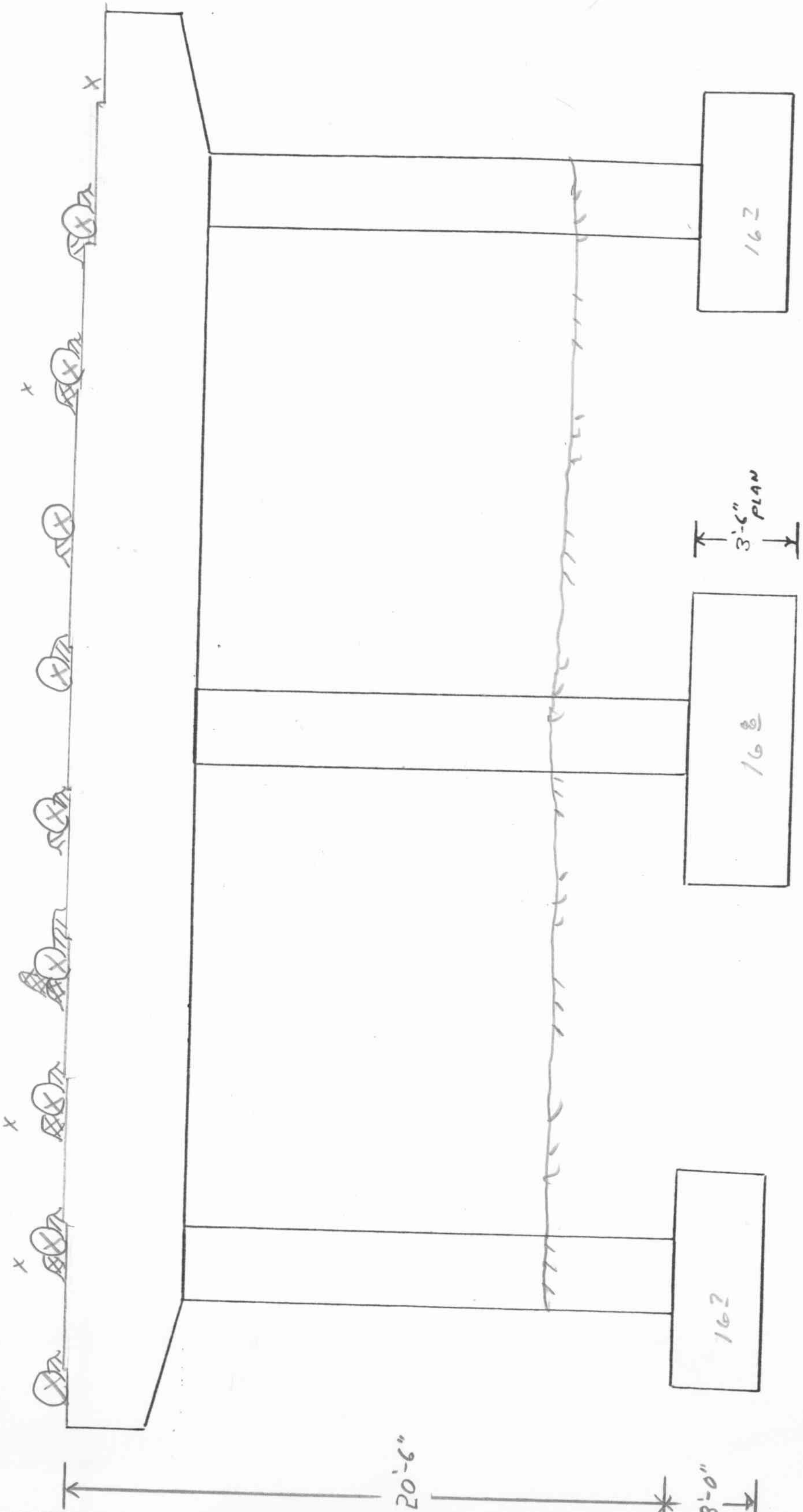
D.G.B. 8-17-94 minor
Holm 6-4-96 MN
Bun 10-21-02 N.C
Bun 1-13-05 N.C
Rks 3-10-10 NC
Rks 3-1-12 NC
[illegible] 03/05/14 NC



Form 810040
7-83

Scale	Bridge No. 8548.4 R 030	Sketch by	Date	Page
60	Sketch of: PIER # 2 - FAR FACE	K.L.H	6-21-84	~~8-7~~
		A.A.R.	NO CHANGE 10-13-86	8-8
		BOYD	N.C. 8-13-90	

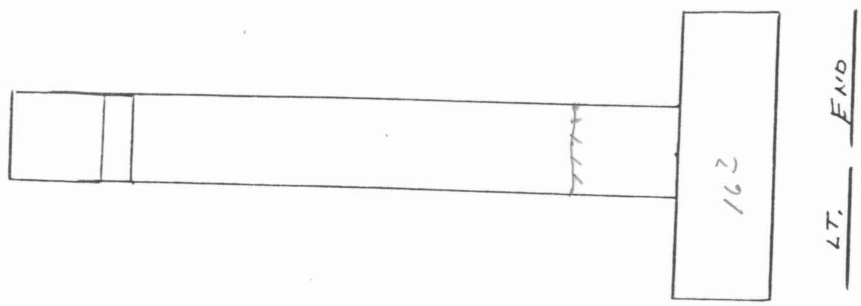
D.G.B. 8-17-94 MINOR
Holm 6-4-96 NC
Bun 10-21-02 N.C
Bun 1-13-05 N.C
RRS 3-10-10 NC
RRS 3-1-12 MN
03/05/14 NC

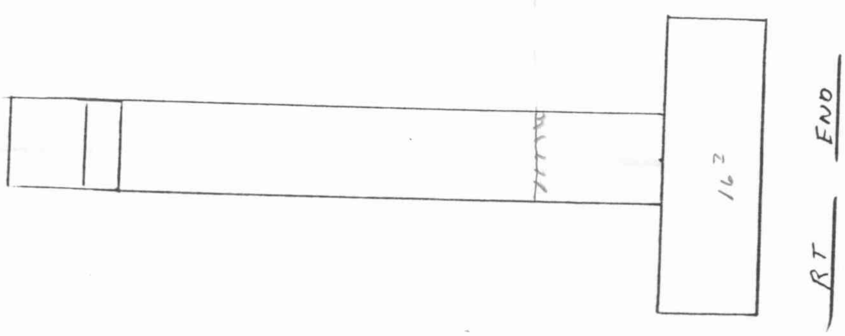


Form 810040
7-83

Scale	Bridge No. 85 48.4 R 030	Sketch by	Date	Page
60	Sketch of: PIER # 2 - RT. & LT. END.	K.L.H	6-21-84	~~B-8~~
		A.A.R.	NO CHANGE 10-13-86	B-9
		Boyd	N.C. 8-13-90	

D.G.B. 8-17-94 N.C.
Holm 6-4-96 NC
Bun 10-21-02 N.C
Bun 1-13-05 N.C
Rks 3-10-10 NC
Rks 3-1-12 MN
03/05/14 NC

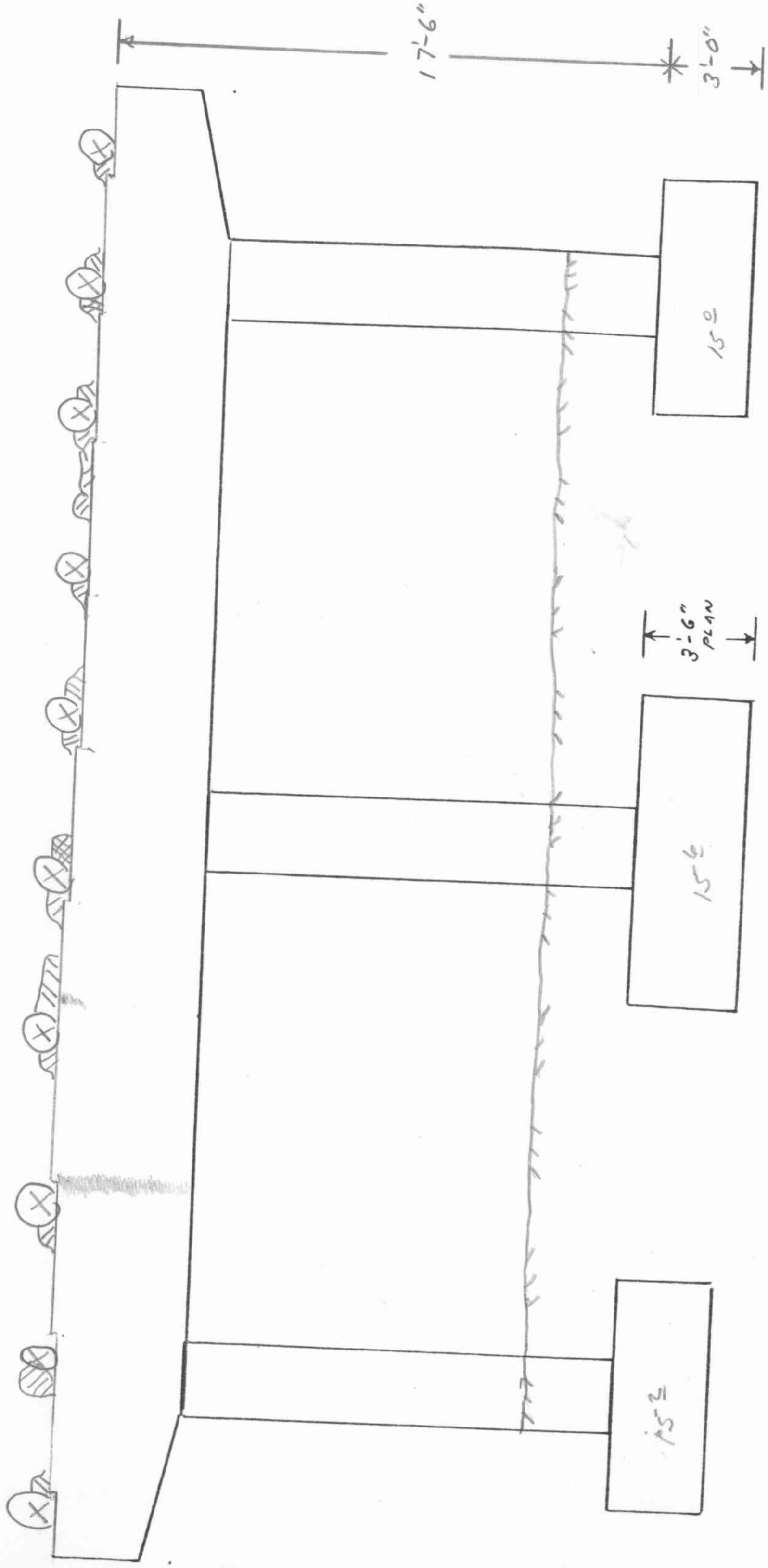




Form 810040
7-83

Scale	Bridge No. 85 48.4 R 030	Sketch by	Date	Page
60	Sketch of: PIER # 3 - NEAR FACE	K.L.H	6-21-84	~~B-9~~
		A.A.R.	MINOR 10-13-86	B-10
		Boyo	N.C. 8-13-90	

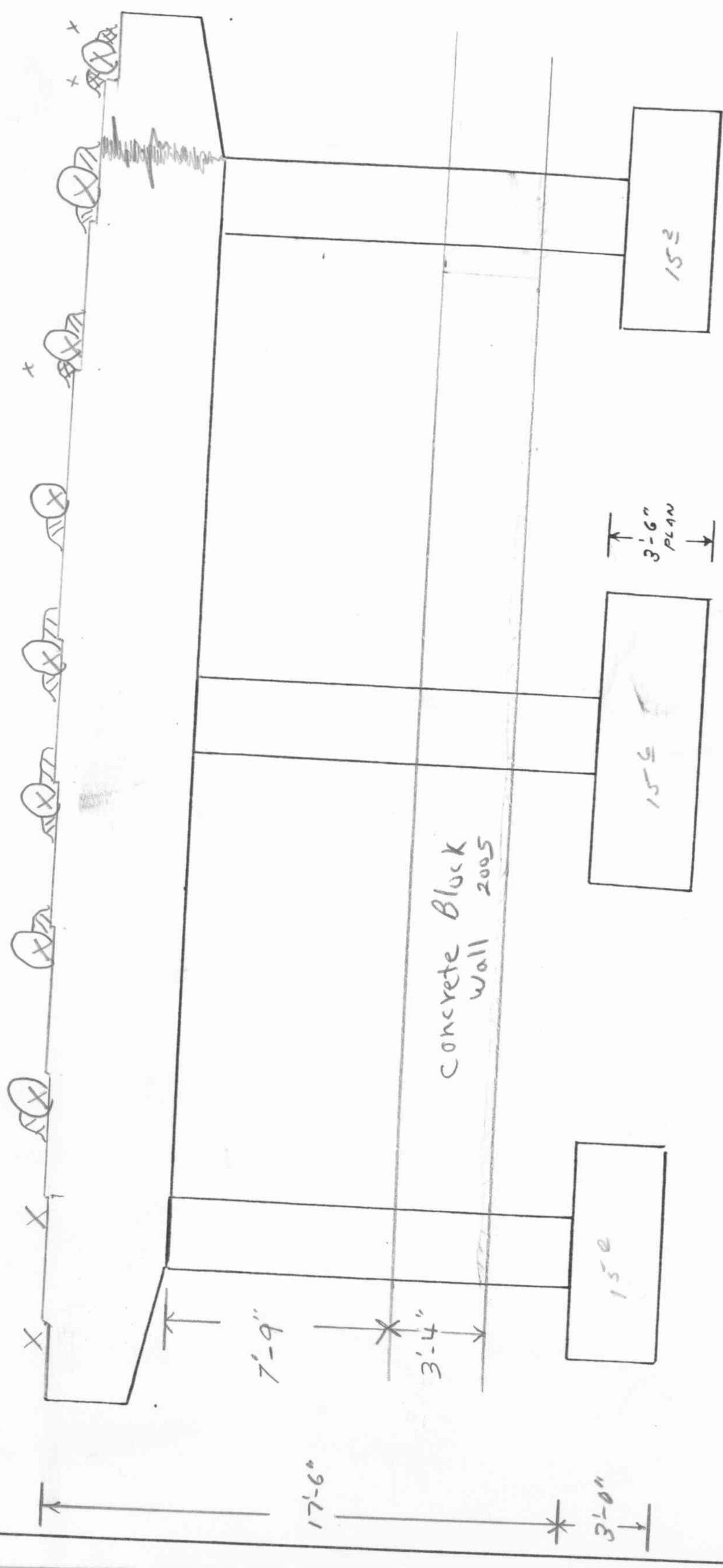
D.G.B. 8-17-94 MINOR
Holm 6-4-96 NC
Bun 10-21-02 M.N
Bun 1-13-05 N.C
Rks 3-10-10 NC
Rks 3-1-12 MN
FI 03/05/14 NC



Form 810040
7-83

Scale	Bridge No. 85 48.4 R 030			
60	Sketch of: PIER # 3 - FAR FACE	Sketch by	Date	Page
		~~K.L.H~~	~~6-21-84~~	~~B-10~~
		A.A.R.	NO CHANGE 10-13-86	B-11
		Boyo	N.C. 8-13-90	

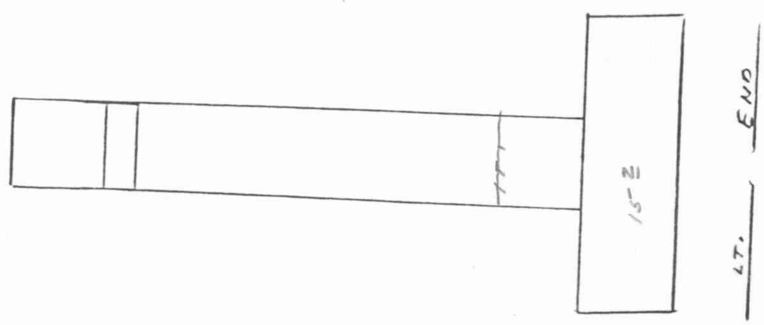
O.G.B. 8-17-94 MINOR
Holm 6-4-96 NC
Bun 10-21-02 M.N
Bun 1-13-05 Block wall
RKs 3-10-10 NC
RKs 3-1-12 MN
[initials] 03/05/14 NC

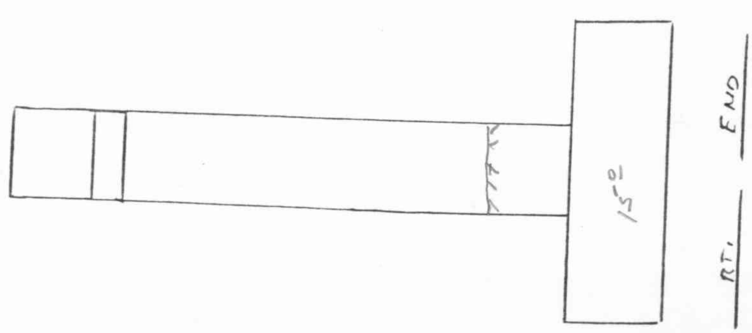


Form 810040
7-83

Scale	Bridge No. 85 48.4 R 030	Sketch by	Date	Page
60	Sketch of: PIER #3 - RT & LT. END	K.L.H	6-21-84	~~B-11~~
		A.A.R.	NO CHANGE 10-13-86	B-12
		Boyd	N.C. 8-13-90	

D.G.B. 8-17-94 N.C.
Holm 6-4-96 NC
Bun 10-21-02 N.C
Bun 1-13-05 N.C
RRo 3-10-10 NC
RRo 3-1-12 MN
FA 03/05/14 NC

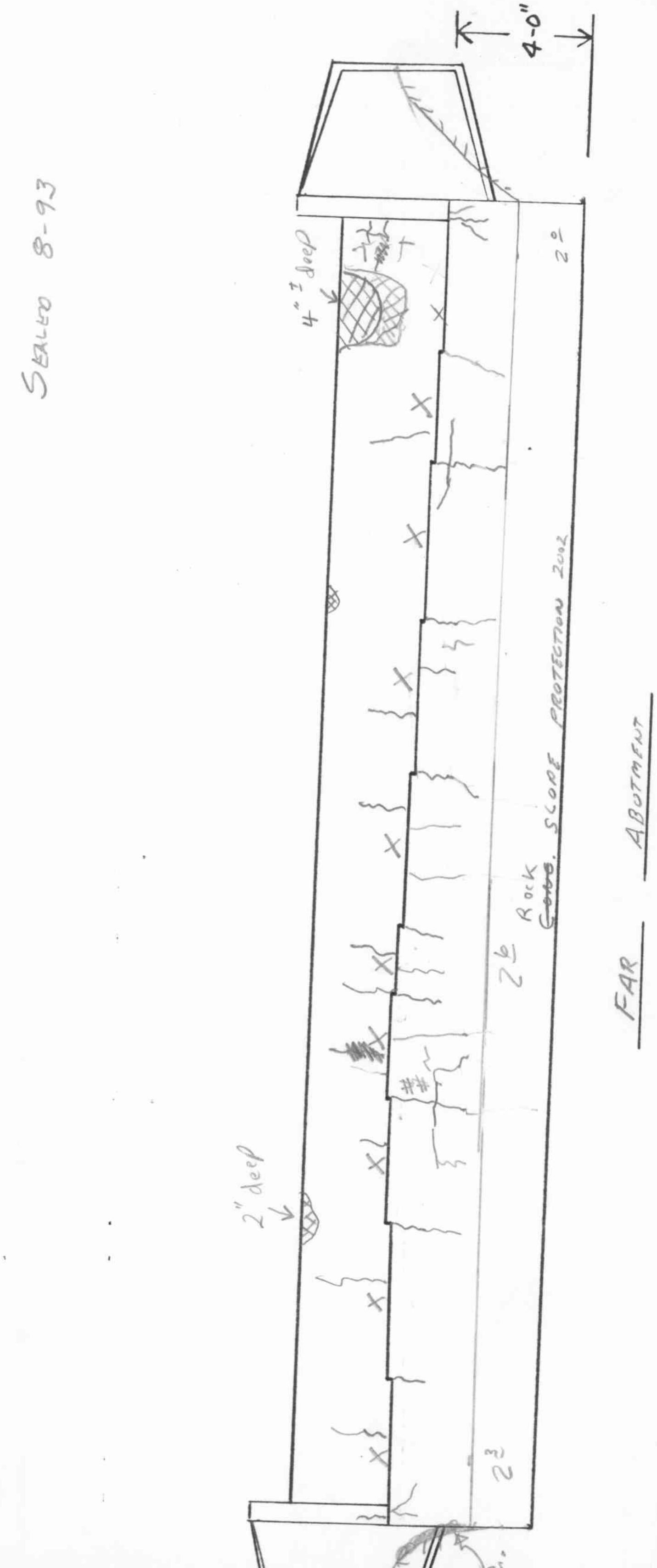




Form 810040
6-77

Scale	Bridge No. 8548.4 R 030	Sketch by	Date	Page
	Sketch of: FAR ABUTMENT	K.L.H	Airline Creek Stall 6-21-84	B-2
		A.A.R.	MINOR 10-13-86	8-13

Boro 8-13-90 N.C.
D.G.B. 8-17-94 MINOR
Holm 6-4-96 NAC
Bun 10-21-02 M,N
Bun 1-13-05 spalls
Rks 3-10-10 NC
Rks 3-1-12 NC
FA 03/05/14 NC



APPENDIX D: MOCK-UP INSPECTION NOTES

5/7/2014

Mock Bridge Inspection with Iowa DOT

Inspectors first orient themselves on site in order to find bridge components quickly. Define east-west and bridge piers are numbered accordingly.

There are two numbers for each bridge: state number and FHWA number. FHWA number does not change, but the state number may change due to milepost changes (the road length maybe changed). Below is an example for state numbering system:

e.g., For the bridge we're studying for this project, FHWA bridge# 48730, and the state bridge number is 8550.2.R.030. The first two digits, 85, indicate that the bridge is located in Story County. Next digits give the milepost information, i.e., the bridge is located on milepost 50.2. R stands for Right, and L stands for Left. And finally "030" tell us that the bridge is located on US 30.

State bridge numbering: County/milepost/R or L (this is important because both sides have the same milepost)

- Basic sketches for near abutment and far abutment are used for orientation purposes.
- It would be good to have access to different views with one click? It would be hard to rotate the model in winter when wearing gloves. – Pen solution!!
- Inspectors do a loop while inspecting a bridge, start with the deck, then superstructure and substructure. At the end of an inspection, every part of a bridge is visually inspected.
- Attaching pictures directly to the BrIM model would be useful
- SIIMS website – resources - Bridge element inspection guide
- When inspecting concrete bridges, they look at the integrity of the bridge, specifically corrosion, spalling, concrete cracks and paint cracks
- It would be good to integrate the legends they use for inspection sketches in the BrIM model. These legends can be found on SIIMS website.
- Impact damage on steel bridges is important.

- 1/16 inch concrete crack and above should be watched.

- They use a crack comparator scale (it is on a card that you can carry in your pocket). They don't worry about the depth of the crack. If there is rust, that tells that the crack is deep and may require further inspection.

- Bearings number, moving angle - vs temperature
  allows expansion of girders

- Possibly show the ground level in the model as it is specifically important for bridges above water?

- Pulling out previous inspection reports, in order to know the critical areas and focus on them is a great benefit of the new technique.

- Indicate the mileposts in the model as it is a major indicator for the location and the name of the bridge. Also it helps in indicating the location of the major components. The inspectors face the direction where the number on milepost increases. Inspectors count the piers and abutments from what is behind them while facing the direction of the increasing number on mileposts and number them from 1 to (whatever the number of piers is). They name the girders from left to right as girder 1, 2, etc.

- Doing a sketch of a problem -if existed- is done on pre-drawn sketches that are not bridge specific. The inspectors need to indicate the location of the element on each sketch, also they need to sign and date each inspection paper, and also no data from previous inspections is available on site in order to compare the severity of the situation.

- Inspection is usually done in two ways, the first is all the inspectors go to the deck, the superstructure and the Substructure and inspect them. The second is by dividing the main three components between the team members in order to do the inspection faster.

- The ground level sketch is important in bridges over water bodies. Inspectors need to sketch the ground level and document that in order to check for erosion (too much erosion may cause buckling). The measurement is done from top of the pier to the ground level.(this measurement has to be compared with previous inspections)

- For most structures there is two bridges (one for each direction of movement) and each bridge requires around 40 papers to do the inspection, the chance of losing one of those papers is high. In addition each paper needs to be signed and dated and then sent to the home office for analysis and decision making.

- Sketching legends of current practice are important to remain the same.