2016 Edition

# Idaho Manual for Bridge Evaluation



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**IDAHO MANUAL FOR BRIDGE EVALUATION**
**SECTION 1:**

# INTRODUCTION

## 1.1—PURPOSE

The *Idaho Manual for Bridge Evaluation* (*IMBE*) is written as a supplement to the AASHTO *Manual for Bridge Evaluation* (*MBE*) Second Edition 2011. The *IMBE* is not intended to override information in the *MBE*; it is intended to provide supplemental information specific to the State of Idaho. The section/article headings in this manual match the section/article headings in the *MBE*. Gaps in the sequencing of sections and articles occur due to the *MBE* providing sufficient guidance resulting in no need to provide supplemental information specific to Idaho.

## 1.4—QUALITY MEASURES

### 1.4.1—Introduction

In order to insure that Idaho's bridges are being inspected and data is gathered in an accurate and consistent manner, it is necessary to implement quality control and quality assurance plans. Accuracy and consistency of the data is important since the bridge inspection process is the foundation of the entire bridge management operation. The accuracy and consistency of the inspection and documentation is vital because it not only impacts programming and funding appropriations, it also affects public safety.

These procedures are intended to maintain the quality of Idaho Transportation Department (ITD) bridge inspection and load rating at or above a specified level. These are daily functions of persons performing safety inspections or load ratings, including consultants. These procedures will provide for uniformity and consistency among the numerous personnel responsible for bridge inspection and load rating.

### 1.4.2—Definitions

**Bridge Asset Management Engineer (BAME)** - ITD person in charge of the National Bridge Inspection Standards (NBIS) program who has been assigned or delegated the duties and responsibilities for bridge inspection, reporting, inventory, and load rating. The BAME provides overall leadership and is available to bridge inspectors, load rating engineers, database managers, consultants, and equipment specialists to provide guidance. The BAME is responsible for the bridge inspection program statewide.

**Bridge Inspector** - ITD personnel in charge of a bridge inspection team (NBIS Team Leader), is responsible for planning, preparing, and performing field inspections. The Bridge Inspector is responsible for the overall management/supervision of an inspection team composed of one or more inspectors. The Bridge Inspector assures that inspections within the jurisdiction of the team are performed on-time and in accordance with the NBIS and ITD's current policies and procedures.

***Bridge Inspector's Reference Manual (BIRM)*** - An FHWA publication that explains the basic concepts of bridge inspection and requirements of the National Bridge Inspection Standards.

**Bridge Inspector Trainee** - An individual who assists a Bridge Inspector with the inspection of a structure.

**Consultant Bridge Inspector** - Personnel hired by ITD to act as a Bridge Inspector on behalf of ITD.

**Consultant Load Rating Engineer** - Personnel hired by ITD to act as a Load Rating Engineer on behalf of ITD

**Database Manager –** ITD personnel in charge of maintaining and updating the central bridge files and the BrM™ Bridge Management System in accordance with ITD's current policies and procedures.

**Load Rating Engineer** - ITD personnel responsible for determining the safe load-carrying capacity of a structure in accordance with AASHTO *Manual for Bridge Evaluation* as modified by the *Idaho Manual for Bridge Evaluation*.

***Manual for Bridge Evaluation (MBE)*** - AASHTO publication that serves as the standard and provides guidance in the policies and procedures for determining the physical condition, maintenance needs, and load capacity of the nation's highway bridges.

**Quality Control (QC)** - Procedures put in place to maintain the quality level of a bridge inspection and load rating program at or above a specified level.

**Quality Assurance (QA)** - An independent evaluation (through the use of sampling and other methods) to measure the quality level of a bridge inspection and load rating program.

**Underwater Bridge Inspection Diver** - ITD or consultant personnel responsible for inspecting underwater elements of a bridge. For safety reasons underwater bridge inspection divers shall work in teams of at least three. One member of the team is designated as the "lead" diver. The lead underwater bridge inspection diver is responsible for documentation of underwater bridge elements and reporting to the bridge inspector. The lead underwater bridge inspection diver assures that inspections within the jurisdiction of the team are performed in accordance with the NBIS and ITD's current procedures.

### 1.4.3—Quality Review Procedures for ITD Bridge Section Performed Inspections

**<u>Field Review</u>**

Review of field inspections by the Program Manager can be a most effective quality control measure. It can build a strong communication link between the inspectors and the reviewer(s).

The BAME or ITD designee (i.e., someone familiar with inspection procedures and coding) will conduct spot checks of Bridge Inspectors working in the field at least once every inspection cycle (24 months). At least three (3) bridges will be reviewed in the field **for each Bridge Inspector**, and may include the following as determined by the BAME:

- truss bridge
- timber girder bridge
- steel girder bridge
- concrete girder bridge (pre-stressed or conventionally reinforced)
- bridge length culvert

These bridges may also include structures that are posted for weight restrictions. Other bridges that may be considered include structurally deficient or functionally obsolete (SD/FO bridges), bridges programmed for rehab/replacement, critical findings bridges, bridges with unusual changes in condition ratings (e.g., more than one appraisal rating change from previous inspections), and bridges that require special inspections (underwater, fracture critical, other special).

This field review will consist of the BAME assessing the correctness and completeness of the inspection, including coding, elements and quantities, maintenance recommendations, and photos as required by ITD's current procedures as well as those needed to depict critical conditions, etc. This review should be done with the inspector(s) present so that any improper coding or procedures can be discussed in the field and immediately corrected.

**<u>Office Review</u>**

The BAME or ITD designee (i.e., someone familiar with inspection procedures and coding) will review at least five (5) bridge files at least once every inspection cycle (24 months), in the office to ensure the information collected during bridge inspections is accurate, consistent, of the highest quality, and readily available. All documentation of inventory and inspection information should be kept in an orderly and retrievable manner. The BAME will review for completeness and accuracy and compare the files to previous inspection reports noting any significant changes.

As necessary, the BAME will review the need to rotate inspection teams including consultants between the Districts.

### 1.4.4—Quality Review Procedures for Bridge Inspections Performed by Consultants

The BAME may delegate the Quality Review procedure of Consultant Bridge Inspectors working in their districts to the Bridge Inspectors, to ensure the quality is acceptable. Consultants are responsible for internal QC/QA controls within their own organization and should be aligned with the QC/QA procedures described in this manual.

**Field Review**

The Bridge Inspector will conduct spot checks of Consultant Bridge Inspectors working in the field at least once every inspection cycle (24 months). The Bridge Inspector will randomly choose at least five (5) bridges to review in the field for each Consultant Bridge Inspector. These bridges will typically have been previously inspected by said Consultant Bridge Inspector. The composition of these five bridges will be such that they represent a cross-section of bridge types inspected. It is strongly recommended that they include one of each of the following:

- truss bridge
- timber girder bridge
- steel girder bridge
- concrete girder bridge (pre-stressed or conventionally reinforced)
- bridge length culvert

Two (2) of these representative bridges will include bridges that are posted for weight restrictions (if available in the bridges area assigned to the Consultant Bridge Inspector). Other bridges to be considered may include structurally deficient bridges, functionally obsolete bridges, bridges programmed for rehab/replacement, critical findings bridges, bridges with unusual changes in condition ratings (e.g., more than one appraisal rating change from previous inspections), and bridges that require special inspections (underwater, fracture critical, other special).

This field review will consist of the Bridge Inspector assessing the correctness and completeness of the inspection, including coding, elements and quantities, maintenance recommendations, and photos as required by ITD's latest policies and procedures as well as those needed to depict critical conditions, etc. This review should be done with the Consultant Bridge Inspector(s) present so that any improper coding or procedures can be discussed in the field and immediately corrected.

**Office Review**

The Bridge Inspector and Database Manager will review all consultant bridge inspection reports to ensure the information collected during bridge inspections is accurate, consistent, and of the highest quality.. Among items to be reviewed are:

- the appropriateness of the identified BrM™ elements and their approximate quantities
- all necessary BrM™ smart flags have been identified and properly coded
- the correlation between spread of BrM™ condition states and the NBIS coding
- work candidates, if needed, are present and appropriate
- load restrictions, if present, correlate with load rating and recommended posting
- all required photos are attached
- the "wearing surface/dead load" does not exceed "max wearing surface for load capacity" by more than ½ inch
- all items necessary for accurate reporting to the NBI are properly coded

The Bridge Inspector will compare the reports to previous inspection reports noting any significant changes. The Bridge Inspector will review the consultant inspected bridge files to see that the file documentation is sufficient, the bridge owner was notified (if a critical finding was found), and the follow up documentation was received to indicate the critical finding has been resolved.

The Database Manager will make completed consultant bridge inspection reports readily available.

**Disqualification**

When the inspection review indicates that a consulting firm and/or Consultant Bridge Inspector continue to make the same or similar mistakes, omissions, etc., ITD may implement disqualification procedures as follows:

Upon receiving notice of incorrect coding and significant findings, the Consultant Bridge Inspector shall address the findings and prepare a report which explains the steps that will be taken to correct the problems to insure they will not be repeated in the future.

The Consultant Bridge Inspector will be placed on probation and reviewed again in three months. This review will be conducted by a team consisting of the Consultant Bridge Inspector, the (ITD) Bridge Inspector, and the BAME. A member of the FHWA also may attend the review if they desire.

If the same or similar mistakes are found during this second review, the Consultant Bridge Inspector shall be given notification that they will be disqualified if these problems are not corrected and avoided in the future, and placed on a secondary probation period of three months.

The Consultant Bridge Inspector shall be reviewed again in three months by the reviewing team. If the same or similar problems are found, the Consultant Bridge Inspector and/or consulting firm will be notified that they are hereby disqualified for a minimum of two years.

A disqualified Consultant Bridge Inspector and/or firm may be re-qualified after the two-year period if they indicate in their term agreement proposal how they have corrected their deficiencies, i.e. refresher training, change in personnel, etc.

**Reasons for Disqualification**

Typical reasons for disqualification can be, but are not limited to, the following:

- lack of proper contact with the bridge owner after finishing inspections in the area
- lack of proper follow-up with the bridge owner for critical findings
- failure to report significant deterioration or damage such as fractured load-carrying members, critical scour at foundations, and vehicular impacts
- failure to perform bridge inspections and produce inspection reports on time
- failure to attend training provided by ITD

### 1.4.5—Quality Review Procedures for Load Rating

An initial rating will be done based on the as-built condition of the bridge for every state and local bridge in accordance with AASHTO *Manual for Bridge Evaluation* as modified by the *Idaho Manual for Bridge Evaluation* and AASHTO *LRFD Bridge Design Specifications* as modified by the *Bridge Design LRFD Manual*. Once the initial rating is done the rating will be modified to reflect any changes in condition of the bridge or dead load applied. These changes will be brought to the attention of the Load Rating Engineer by review of the bridge inspection reports.

The following procedures shall apply for all load ratings done by ITD personnel; procedures for consultants may vary per the consultant agreement:

**Rater**

All the data available for the structure to be load rated shall be collected and reviewed for completeness and accuracy. The inspection report and photos will be compared to any plans or sketches to ensure they are for the bridge in place. The load rating will be based on the current loads on the bridge. The rater will generate a computer file for the bridge and fill out an ITD Load Rating Summary Form (LRS).

**Checker**

The checker will review all the available data for the bridge and check the rater's conclusions for current loads. The input for the load rating computer file will be confirmed by the checker and the file will be run to confirm the output. All information on the LRS will be checked for completeness and accuracy. The computer file and LRS along with any comments are returned to the rater for correction, or a stamp and signature.

**QC/QA**

Once the rater and checker have a completed checked rating, the computer file and LRS will be submitted to the QC/QA person for review. The ITD Quality Assurance Checklist (internal ITD document only) will be filled out for the load rating. If there are any comments, the rating goes back to the rater for correction. Once the QC/QA person determines the computer file and LRS form are correct, the rating information is input into the BrM™ database, a hard copy of the LRS form is put in the bridge file, and the computer model is put into use for the analysis of overweight permit vehicles. Additional QC/QA information for the load rating analysis can be found in Section 6 of this manual.

### 1.4.6—Qualifications of Personnel

See Article 4.4 for detailed qualifications of personnel.

### 1.4.7—Personnel Files

Personnel qualifications are maintained in ITD central HR files. HR files contain:

- years, position title, and responsible duties
- training completed
- certifications/registrations

### 1.4.8—Continued Training Requirements

The Program Manager and Bridge Inspectors (ITD and Consultant) must take at least one training course every four years. Training courses may be scheduled by the Bridge Asset Management Engineer as budget considerations allow. Suggested topics include:

- any NHI training courses, these may be rotated over several inspection cycles to cover all topics
- Bridge Inspection Refresher Training
- Engineering Concepts for Bridge Inspectors
- Safety Inspection of In-Service Bridges
- Fracture Critical Inspection Techniques for Steel Bridges
- Inspection of Ancillary Highway Structures
- Underwater Bridge Inspection
- OSHA Confined Space Training
- Specialized Equipment Training
- other safety training

### 1.4.9—Reference Manuals and Publications

As can be true with any inspection, specific problems not covered in these general procedures may be encountered. If that is the case, the inspector will want to refer to manuals which describe special inspection procedures and equipment needs in greater detail.

Suggestions are:

- *Idaho Bridge Inspection Coding Guide*
- FHWA *Recording and Coding Guide for the Structure Inventory and Appraisal of the Nations Bridges*
- AASHTO *The Manual for Bridge Evaluation (MBE)*
- NHI *Bridge Inspector's Reference Manual (BIRM)*
- AASHTO *Guide for Commonly Recognized (CoRe) Structural Elements*
- FHWA *Inspection of Fracture Critical Bridge Members*
- HEC 18 *Evaluating Scour at Bridges*
- HEC 20 *Stream Stability at Highway Structures*
- HEC 23 *Bridge Scour and Stream Instability Countermeasures Experience, Selection, and Design Guidance*
- FHWA *Guidelines for the Installation, Inspection, Maintenance and Repair of Structural Supports for Highway Signs, Luminaries, and Traffic Signals*

If the inspector does not find the guidance needed, the concern should be brought to the attention of the BAME. Consultant Bridge Inspectors should contact the Bridge Inspector responsible for the area they are working in.

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## 4.2—PROVISIONS TO SUPPORT THE NBIS REQUIREMENTS

### 4.2.2—Qualifications of Personnel

Responsibilities of Inspection Personnel may vary due to section needs and staffing availability. Duties not covered by the CFR may be switched as necessary and new duties may be assigned as allowed in the ITD Human Resources *Employee Policy & Procedure Handbook.*

#### 4.2.2.1—Inspection Program Manager

The Bridge Asset Management Engineer (BAME) is the inspection program manager and meets all qualification requirements specified in *23 CFR 650.309*. The BAME is responsible for Idaho's compliance with the National Bridge Inspection Standards which include the inspections, load ratings, and scour evaluations of all bridges in Idaho. The BAME is also responsible for the analyses of state bridges for over legal truck loads.

The BAME manages a staff which includes state bridge inspectors, load rating engineers, a special projects engineer, and a bridge inspection equipment specialist. The BAME or designee also administers contracts with local bridge inspection consultants, and load rating consultant engineers.

#### 4.2.2.2—Inspection Team Leader

ITD has three bridge inspectors, all of whom meet the qualification requirements for team leader specified in *23 CFR 650.309*. Each inspector is responsible for the inspection of state bridges in two districts. Districts 1 and 2 comprise an area, as do Districts 3 and 4, and Districts 5 and 6. ITD's bridge inspection program is centralized. The inspectors travel to their respective areas from the Boise headquarters.

ITD contracts with 7-10 consultants to inspect locally-owned bridges throughout the state. These contracts are negotiated biennially with qualified firms from ITD's term agreement list. All consultants are qualified as team leaders according to *23 CFR 650.309*. The consultant inspection areas typically follow county lines.

Inspectors are responsible for the inventory, routine, fracture critical, underwater, complex, damage and all special inspections of the bridges in their areas. ITD presently is a licensee of BrM™ and inspectors use this software for all data collection and reporting. The state bridge inspectors are responsible for reviewing the consultant prepared inspection reports of areas in their districts.

ITD contracts with a firm to perform the underwater inspections for all state and local bridges whose foundations cannot be inspected and evaluated during a routine inspection.

#### 4.2.2.3 – Bridge Inspector Trainee

The trainee position gives an individual the experience necessary to meet the requirements of team leader as specified in *23 CFR 650.309*. Experience is gained by successfully completing required training and assisting the team leaders with performing routine, fracture critical, in-depth, and other inspection types. The inspector trainee, after gaining experience, is also responsible for the inventory, inspection and reporting of the short-span bridges. These are structures on the state system with lengths greater than or equal to 10 feet but less than or equal to 20 feet.

#### 4.2.2.4—Bridge Inspection Equipment Specialist

The Bridge Inspection Equipment Specialist (BIES) is responsible for the operation and maintenance of ITD's under-bridge inspection truck (UBIT). This includes all maintenance, repairs and inspections of the boom and the UBIT itself. The BIES shall maintain all records showing maintenance and inspections of the UBIT. This position also makes sure all equipment required for inspections is maintained and is in working order. The BIES shall make recommendation(s) for the purchase of new equipment.

The BIES is responsible for scheduling the UBIT with the state inspectors and consultant inspectors, making every effort to coordinate the truck with the inspection due date. This position is responsible for scheduling the truck with outside agencies and all contractual documents required by ITD for use of the truck, other equipment and additional inspection personnel.

#### 4.2.2.5—Database Manager

ITD uses an Oracle database with BrM™. The database manager is responsible for the accuracy and integrity of the items required by the NBI, additional Idaho specific items, and element data for all bridges in Idaho. The database manager is also responsible for the yearly update to the NBI of Idaho's bridge data.

Additional responsibilities of this position include:

- creating reports for ITD management, other sections and outside agencies requesting bridge data
- testing new versions of the BrM™ software
- installing BrM™ on users' computers
- troubleshooting and responding to users' questions regarding BrM™
- checking in and out bridge data from ITD and consultant inspectors
- assigning permissions to users for access to bridge data
- overseeing the Critical Findings process
- overseeing the posting & closing of bridges
- quality assurance of inspection reports

#### 4.2.2.6—Load Rating Engineer

All new bridges must be load rated according the procedures described in this manual and *Articles 0.3 and 0.4* of the *Bridge Design Manual*. This as-built model provides a benchmark for future load ratings as the bridge deteriorates over time. Overlays, improvements, and deterioration may trigger a new load rating. Bridges are analyzed for the carrying capacity for the design truck, HS-20 vehicle, the three Idaho posting trucks, the 121 kip truck, and the Notional Rating Load (NRL).

ITD has a team of licensed engineers in BAM whose primary duties are load ratings. All meet the qualifications as specified in *23 CRF 650.309(c)*. Responsibilities include modeling the bridge in the AASHTOWare Bridge Rating program (BrR™), analyzing the results, troubleshooting errors, and providing rating factors for the required trucks. All load ratings are checked by another engineer and QA'd before the electronic bridge model is finalized. Additionally, the load rating engineer fills out a load rating summary sheet for the bridge file and prepares posting letters for the BAME's signature if load posting is required.

#### 4.2.2.7—Special Projects Engineer

The special projects engineer has a variety of duties, including being the sentinel for the BridgeWatch™ system. This person is responsible for evaluating and responding to alerts from the system, working with the contractor to ensure that all scour critical and high risk unknown foundation bridges are in the system and advising the scour committee of changes or adjustments necessary so that personnel can respond to alerts in a timely manner.

This position is responsible for maintaining the IMBE and ensuring that it is compatible with all updates to the MBE. This position also is part of the load rating staff and may be assigned other duties of the section that have to do with inspection, scour evaluation, and overweight permitting.

### 4.2.3—Inspection Types

#### 4.2.3.1—Inventory (Initial) Inspections

The inventory (initial) inspection is the first inspection conducted on a bridge by ITD. An inventory inspection must meet all the requirements of a routine inspection (see *Article 4.2.3.2*) including all Structure Inventory and Appraisal (SI&A) data and other relevant element level data necessary to determine the baseline structural condition.

An inventory inspection shall occur:

- following the construction of a new bridge
- when a structure previously under the jurisdiction of another agency is added to the state system or local/off system

New bridges or existing bridges added to the inventory (typically with jurisdictional change), not previously inspected by ITD shall have an inventory inspection within a period of time determined by *Table 4.2.3.1-1*.

**Table 4.2.3.1-1 Inventory Inspection Time Limit**

| | New Bridges | Existing Bridges |
|---|---|---|
| State Bridges | 90 days | 90 days[a] |
| Local Bridges | 180 days | 180 days[a] |

[a] Consideration shall be given to inspecting these bridges at the same time as others in the area.

#### 4.2.3.2—Routine Inspection

A routine bridge inspection is a regularly scheduled inspection that generally consists of visual observations and/or measurements that are needed to determine the following:

- the physical and functional condition of the bridge
- changes from initial or previously recorded conditions
- repairs or other services that may be needed

#### 4.2.3.3—In-Depth Inspection

An in-depth inspection is sometimes referred to as a hands-on inspection and should be conducted at arm's length. Typically, the under-bridge inspection truck (UBIT) is used during an in-depth inspection. Anytime a bridge element or a portion of the bridge requires further evaluation, analysis, or investigation to accurately assess its condition, an in-depth inspection shall be performed. This inspection may involve testing, monitoring, or conducting specific analyses of select bridge elements.

The in-depth inspection is typically performed:

- to assess bridge elements not accessible during routine inspections
- to obtain more sophisticated data
- to perform special testing
- to bring in other experts to assess a particular problem

#### 4.2.3.4—Fracture Critical Inspection

A fracture critical member (FCM) is a steel member, in tension, that is not load path redundant. Fatigue is the primary cause of failure in fracture critical members. Failure of a FCM has the potential to cause the bridge to collapse.

The purpose of a fracture critical (FC) inspection is to identify and record the location of FCMs and any problems or potential problems at these locations in order to determine the safety of the structure. FC inspections provide a history of cracking (time of initiation, rate of growth, etc.) that can greatly assist the engineer in determining the need and priority of repairs and in estimating the remaining life of the bridge.

Fracture critical inspections are always done in conjunction with a routine inspection, the fracture critical inspection schedule and follow up procedures are part of the routine inspection report.

#### 4.2.3.5—Underwater Inspection

If the underwater portion of a bridge substructure or the surrounding stream channel cannot be inspected visually at low water by wading or probing, it shall require an underwater inspection using divers or other appropriate techniques to accomplish these tasks. An inspection team leader must be present for all underwater inspections.

#### 4.2.3.6—Special Inspection

Special inspections are performed to monitor known or suspected deficiencies. Special inspection reports shall clearly indicate what elements were looked at, what methods of inspection were used (visual, dye penetrant, ultrasonic, hands on, etc.), and what was found. Bridges meeting the following criteria may have special inspections:

Fatigue-prone details on steel girder bridges: Fatigue-prone details are category E or E’ details and fatigue to these details is typically caused by out of plane bending. Generally, the procedures for special inspections are the same as those for fracture critical.

Other defects: These are defects that are identified by the inspection team leader where additional monitoring may be needed. These defects should be documented in the inspection report and discussed with the BAME for concurrence to perform special inspections.

There is no unique report for special inspections. Conditions are included in the appropriate BrM™ element commentary. Repair recommendations are documented in the Maintenance Recommendations section of the report.

#### 4.2.3.7—Damage Inspection

Damage inspections are unscheduled inspections required when a bridge has been damaged. A damage inspection must be conducted by an inspection team leader.

A damage inspection can occur following:

- a vehicle striking the bridge
- high water under the bridge
- a severe environmental event such as an earthquake or tornado

##### *4.2.3.7.1—Damage Assessments*

Following notification of potential damage to a bridge, the BAME may request an onsite damage assessment be conducted by ITD personnel who are near the affected bridge. Damage assessors usually do not meet the requirements of an inspection team leader but serve an important role because they are often the first-responder(s) for the Department.

Measurements and photographs of damage may be required so that the BAME can determine:

- whether or not to dispatch a bridge inspection team
- if a bridge should be closed or restricted until bridge inspectors can get to the site and inspect the damage

No official report is required. A phone call or email to BAM staff is sufficient documentation of a damage assessment.

## 4.2.4—Inspection Intervals

### 4.2.4.1—Inventory (Initial) Inspection Interval

The inventory inspection shall be conducted within 90 days of opening to traffic for new state bridges and within 180 days of opening to traffic for local bridges.

### 4.2.4.2—Routine Inspection Interval

See IMBE *Article 4.2.3.2* for a description of routine inspections.

For structures meeting **one** of the following criteria routine inspections shall be conducted at regular intervals **not to exceed 12 months.**

1. A condition rating of 4 or less for at least one of the following NBI items:
   a) Deck (Item 58)
   b) Superstructure (Item 59)
   c) Substructure (Item 60)
   d) Culvert (Item 62)

2. Any structure may have a shorter inspection frequency when recommended by the inspection team leader and approved by the BAME. The reason(s) for increasing the frequency will be documented in the inspection report in the notes to the BAME

For structures meeting **all** of the following criteria routine inspections shall be conducted at regular intervals **not to exceed 48 months.**

1. Structure must have condition ratings of 6 or greater (Items 58, 59, 60, 61, and 62).

2. Structure must have an inventory rating (Item 66) equal to or greater than the HL-93 loading, HS-20 loading at 36 tons, or the MS-18 loading at 32.4 tons.

3. Structure is open with no restrictions (Item 41 = A and Item 70 = 5).

4. Structure has spans of 100’ or less (Item 48).

5. Structure has load path redundancy (not fracture critical) (Item 43B & 44B ≠ 3, 9, 10, 13, 14, 15, 16, 17 or 00 types). Structure design is not uncommon or unusual (Item 43B = 14 and 21) and has a proven performance history. Complex bridges do not qualify for a 48 month frequency.

6. Minimum vertical clearance over the bridge roadway (Item 53) must be greater than 14’

7. Minimum vertical underclearance must be greater than 14’ when the bridge is over a highway (Item 54A = H and Item 54B > 14).

8. Structure has not been in service for more than 75 years (Item 27).

9. Structure does not include material types such as timber, masonry, aluminum, wrought iron, cast iron, and other (Items 43A and 44A).

10. Structure has received an inventory inspection (if new) and at least 1 routine inspection approximately 24 months after construction/rehabilitation was completed. The inventory (if new) and routine inspection(s) must reveal no major deficiencies

11. Structure is not scour critical, does not require action to address scour, does not have an unknown foundation, and has been evaluated for scour (Item 113 ≠ 0-4, 6, T, or U).

12. Structure has a maximum ADTT of 9800 trucks per day (Items 29 and 109).

13. Structure has not been determined by the Bridge Inspection Program Manager to need a frequency of two years or less. If Bridge Inspection Program Manager sets a frequency of 2 years or less, this will be documented in the "NOTES" section of the inspection report.

For structures not meeting the criteria for a 12 or 48 month inspection cycle routine inspections shall be conducted at regular intervals **not to exceed 24 months.**

*4.2.4.2.1—Increases in Routine Frequency*

If the routine inspection frequency of a bridge increases as a result of a change found during an inspection the next routine inspection will be scheduled accordingly. If the routine inspection frequency increases in between scheduled routine inspections as a result of a change in items such as scour code, new load rating, new posting status, or ADTT>9800 the next routine inspection shall be scheduled to be conducted within 12 months of recording the change in BrM. If the next scheduled routine inspection was already planned to occur within the next 12 months the inspection shall be conducted as scheduled. Changes to frequency should be documented in the bridge notes. Notes should include when the change occurred (date), what caused the change, and the new date (MM/YY) of the next scheduled inspection.

Example 1: A bridge is on a 48 mo. frequency scheduled to be inspected in 23 months, the scour code is changed from 8 to U, causing the frequency to increase to 24 months. The next routine inspection will be moved up and scheduled to occur in the next 12 months.

Example 2: A bridge is on a 48 month frequency scheduled to be inspected in 8 months, a new load rating is conducted and the bridge is now posted, causing the frequency to increase to 24 months. The next routine inspection will be conducted as scheduled in 8 months.

Bridges that are on a 48 month inspection and approaching 75 years in service (age) will be individually reviewed by periodically running a query in the database for bridges 73-74 years old. On these bridges, the next scheduled routine inspection will be adjusted to occur on or before the bridge reaches 75 years old. In addition its routine frequency will be increased to 24 months or less as appropriate.

**4.2.4.3—In-Depth Inspection Interval**

In-depth inspections are typically conducted on a **48 month** interval. The in-depth inspection frequency may be increased to **12 months** or **24 months** at the recommendation of the inspection team leader with the approval of the BAME. This increase in frequency should be based on the severity of the deterioration of key structural elements. The in-depth inspection frequency may be reduced up to **72 months,** with the approval of the BAME, if Deck (Item 58), Superstructure (Item 59), and Substructure (Item 60) are all 6 or above. The reason(s) for changing the frequency shall be documented in the inspection report in the Notes section. See *Article 4.2.3.3* for a description of in-depth inspections.

**4.2.4.4—Fracture Critical Inspection Interval**

Fracture critical inspections shall be conducted at regular intervals **not to exceed 24 months**. See *Article 4.2.3.4* for a description of fracture critical inspections.

If the routine inspection frequency is increased to 12 months or less due to a fracture critical member having a Superstructure (Item 59) coding of 4 or less, the fracture critical inspection frequency shall match the routine inspection frequency. The fracture critical inspection may remain at a 24 month frequency even though the routine inspection frequency has been increased provided the Superstructure is in fair condition (Item 59 > 4

4.2.4.5—Underwater Inspection Interval

Underwater inspections shall be completed at regular intervals **not to exceed 60 months**. See *Article 4.2.3.5* for a description of underwater inspections. All bridges shall be on a 60 month inspection cycle unless they meet one of the following criteria for more frequent inspections:

1. If NBI Item 113=2 indicating that the bridge is scour critical, the underwater inspection frequency shall be set to **12 months.**

2. If the inspector observes conditions that warrant monitoring at an increased frequency, the underwater inspection frequency shall typically be set to **12 months** upon approval of the BAME**.** These conditions may include but are not limited to; evidence of substructure movement, significant deterioration or undermining in a primary underwater element, significant stream migration, significant bank sloughing, or debris buildup.

A Special Inspection may be conducted in lieu of an Underwater Inspection to monitor a known deficiency in between required 60 month inspections if the BAME deems it appropriate.

Anytime the inspector determines the inspection frequency needs to be changed, the reason shall be documented in the underwater inspection report (an example underwater inspection report is included as *Appendix 4.4*) and discussed with the BAME. If the frequency is unchanged, the date of the underwater inspection in which the frequency was set shall be noted on the current underwater inspection report.

**4.2.4.6—Special Inspection Interval**

Special inspections fall into the following categories:

- Fatigue-prone details on steel girder bridges: Inspections on fatigue-prone details on steel girder bridges are typically conducted on a **48 month** interval. The inspection frequency may be increased to **12 months** or **24 months** at the recommendation of the inspection team leader with the approval of the BAME. This increase in frequency depends on the severity of the deterioration of the structural element(s) having fatigue-prone details. The special inspection frequency may be reduced up to **72 months,** with the approval of the BAME, if Deck (NBI Item 58), Superstructure (NBI Item 59), and Substructure (NBI Item 60) are all 6 or above. The reason(s) for changing the frequency shall be documented in the inspection report in the Notes section. See *Article 4.2.3.6* for a description of special inspections.

- Other defects: With the approval of the BAME, a special inspection may be conducted in between scheduled inspections to monitor a known defect.

**4.2.4.7—Damage Inspection Interval**

Damage inspections are scheduled as needed to assess damage to the bridge following an environmental or human caused event. A damage inspection or damage assessment shall be conducted within 24 hours of reported damage. See *Article 4.2.3.7* for a description of damage inspections. .

**4.2.5—Inspection Procedures**

**4.2.5.1—General**

ITD has adopted the numeric coding system in *Recording and Coding Guide for the Structure Inventory and Appraisal of the Nations Bridges* (FHWA, December 1995) for NBI inspections. Element level inspections are conducted in accordance with *AASHTO Commonly-Recognized Bridge Elements* (AASHTO, June 2000), and *Idaho Coding Guide* (ITD, 2010).

**4.2.5.2—Inventory (Initial) Inspection Procedure**

The effort and intensity should be sufficient to accurately document the baseline condition of all AASHTOWare Bridge Management™ (BrM™) elements and NBI items. Traffic control and special access equipment, though not typically used for an inventory inspection, may be required.

The inspection team should have a set of as-built bridge drawings (if available) to refer to when performing the inventory inspection. When bridge plans are not available, the inspection team shall take field measurements to complete the inventory inspection.

An example of a completed Structural Inventory and Appraisal report is included as *Appendix 4.5*. A blank Inventory Inspection form is included as *Appendix 4.6*

**4.2.5.3—Routine Inspection Procedure**

The inspection team shall provide all Structure Inventory and Appraisal (SI&A) data and other relevant element level data needed to determine the structural condition in sufficient detail to clearly establish the bridge's condition and to ensure its continued safe operation.

The level of scrutiny and effort required to perform a routine inspection shall vary according to the structure's type, size, design complexity, and existing conditions. To provide a reasonable level of confidence in the safety of the bridge, knowledge of the structure and good engineering judgment are necessary to determine those portions that shall receive close-up scrutiny during a routine inspection.

Routine inspections are generally conducted from the deck, ground, and/or water levels. Typically ladders are utilized and permanent work platforms or walkways may also be used, if present. Inspection of underwater members of the substructure is generally limited to observations during periods of low flow and/or probing/sounding for evidence of local scour.

Photographs shall accompany the inspection reports showing:

- bridge looking down roadway
- elevation view of bridge
- posting signs (if applicable)
- any damage noted in the report
- anything that warrants further review by the BAME

In general, the more severe the issue, the more detail and photographs should be provided in the inspection report. An example of a completed ITD Structure Inventory and Appraisal report is included in *Appendix 4.5*.

One channel cross section upstream of the bridge must be performed when the substructure or some portion of the substructure is in the water during routine inspections. Channel cross sections shall be performed at least every four years. If Item 113 = 2, a channel cross section shall be performed every two years. Certain circumstances, such as a flooding event or shift in stream flow, may require that channel cross sections be performed more frequently.

A channel cross section is <u>not</u> required when:

1. The structures SI&A item 113 is coded a '9' for being on dry land.
2. Channel cross sections are performed as part of an underwater inspection.
3. The bridge is over water seasonally, but the entire substructure is dry during every routine inspection. (e.g., canals)
4. The entire substructure has been dry the previous two inspections but has water during the current year's inspection.
5. The structure has a constructed floor or full channel lining through it. This also includes pipes.

If not performing a channel cross section due to number 4 the inspector shall state this in the channel notes of the inspection report. A statement similar to this shall be used: "The channel had water in it during this 2012 inspection, but has been dry the previous two inspection cycles. A channel cross section was not performed." This shall give inspectors in the future the information they need to determine whether or not they are required to perform a channel cross section during the following inspection.

An example of a channel cross section is included in *Appendix 4.1*.

### 4.2.5.4—In-Depth Inspection Procedure

In-depth inspection reports shall generally contain sufficient detail to understand what elements were inspected at an in-depth level, description of findings (including sketches and photos as appropriate), and any other pertinent information to facilitate future inspections such as equipment and/or methods used to analyze and assess elements.

An in-depth inspection should be recorded on the non-SI&A inspection form. A blank non-SI&A inspection form is included as *Appendix 4.7*.

### 4.2.5.5—Fracture Critical Member Inspection Procedure

The inspection intensity of all FCM's during a fracture critical inspection should be sufficient to discover the onset of fatigue cracking. The inspector must have a hands-on level of access to all FCMs. Prior to the inspection the inspector should review the available information for the bridge such as the construction plans, sketches, specifications, shop drawings, prior inspection reports, photos, etc. and consider the details present on the bridge along with the condition of the FCMs.

Inspection for each FCM shall adhere to the following general procedures.

1. Visually inspect for cracks, rust, nicks, gouges, or impact damage.

2. Check for loose, bent, misaligned, un-even or un-evenly loaded members.

3. Check all bolted, riveted, or welded connections in tension areas.

4. Use mirrors or other equipment to check inside surfaces.

5. Check all connections at gusset plates, with emphasis on the first row (closest row to edge of plate).

6. Check for any welds, including plug, tack, or repair welds.

7. Check the flanges of the steel girders in tension areas where they change thickness or widths.

In addition to the general procedures, each FC bridge shall have unique procedures specific to the bridge which contain information necessary to convey to an inspector preparing to perform an FC inspection. The unique procedures describe additional steps in the inspection plan and are intended to mitigate significant risk factors associated with a particular bridge

The unique procedures summarize in the written narrative and where feasible by annotation on the drawings identifying FCMs, the pertinent details and/or focus (emphasis) areas for the bridge. It is not necessary to list each FCM in the narrative of the unique procedure, as other sections of the report contain this information. However, if one FCM is especially severe then specific mention of that FCM and its particular concern might warrant specific mention in the unique procedures.

Generally speaking unique procedures are brief and concise. On some bridges in very good condition with no known defects or risk factors, unique procedures may not be applicable beyond a reference to the general procedures. Note this accordingly on the form. In other instances, bridges in poor condition or bridges with several risk factors present will contain several steps in the unique procedures to convey this information to future inspectors.

Potential risk factors for FCMs and their reference can be found in table 4.2.5.5-1; the table is not all inclusive but is to be used as a guide to assess risk and to develop specific/unique inspection procedures.

**Table 4.2.5.5-1 Fracture Critical Risk Factors**

| **Fracture Critical Risk Factor** | **Reference** |
|---|---|
| **Problematic Materials** | |
| Welded Structural Carbon Steel AASHTO M94 (ASTM A7) | BIRM page 6.3.iv & BIRM page 6.3.6 |
| Welded Structural Silicon Steel AASHTO M95 (ASTM A94) | BIRM page 6.3.iv & BIRM page 6.3.7 |
| Welded Structural Nickel Steel AASHTO M96 (ASTM A8) | BIRM page 6.3.iv & BIRM page 6.3.7 |
| Welded "T-1" Steel AASHTO M270 Grade 100 (ASTM A514/A517) | FHWA Technical Advisory 5140.32 |
| **Fatigue and Fracture Prone Details** | |
| AASHTO Categories D, E, E' | BIRM page 6.4.33, AASHTO's LRFD & MBE |
| **Problematic Details** | |
| Tri-axial Constraint | BIRM page 6.4.49 |
| Cover Plates | BIRM page 6.4.51 |
| Cantilevered suspended span | BIRM page 6.4.52 |
| Insert plates | BIRM page 6.4.53 |
| Out-of-plane bending | BIRM page 6.4.56 |
| Pin and hanger assemblies | BIRM page 6.4.62, 10.7.1 |
| Mechanical fasteners (bolt holes and rivets) | BIRM page 6.4.63 |
| Flange Termination | BIRM page 6.4.64 |
| Coped flanges | BIRM page 6.4.65 |
| Blocked flanges | BIRM page 6.4.66 |
| Nicks, gouges, notches, indentations | BIRM page 6.4.24 & 6.4.67 |
| **Poor Welding Techniques** | |
| Intersecting Welds | BIRM page 6.4.50 |
| Field welds (patch & splice plates) | BIRM page 6.4.54 |
| Plug Welds | BIRM page 6.4.12 |
| Intermittent or stitch welds | BIRM page 6.4.55 |
| Tack Welds | BIRM page 6.4.12 |
| Back-up bars | BIRM page 6.4.62 |
| **In Service Flaws** | |
| Impact damage to FCMs | BIRM page 6.4.24 |
| Improper heat straightening | BIRM page 6.4.25 |
| Indiscriminate welds | BIRM page 6.4.24 |

Secondary Fracture Critical Risk Factors

The bridge's condition and traffic may constitute secondary fracture critical risk factors. These factors have the potential to cause or exacerbate fracture critical risk factors listed in the table above. These factors should be considered by the inspector when developing unique procedures for the bridge. Secondary factors are largely based on SI&A data recorded elsewhere in the report. Generally they do not need to be specifically called out in the unique procedures unless the inspector determines that there is valuable information to convey to future inspectors. Secondary factors include but are not limited to:

- Load Restriction (NBI Item 41 ≠ "A") – Due to design or deterioration the bridge capacity is less than current legal loads, may be subject to overloads, may exhibit fatigue damage

- Cold Service Temperatures – May cause steel to become brittle reducing tensile strength or cause shrinkage affecting the geometry of bridge causing cracking or other damage, critical temperature depends on steel grade.

- Poor Superstructure (NBI Item 59 ≤ 4) – Significant section loss in critical stress area. Minor fatigue or out of plane bending cracks may be present in major structural elements.

- Older Bridge (NBI Item 27 ≤ 1980) – Fatigue, fracture, and toughness were not primary concerns when designing bridges prior to the 1980's. Material standards have become more stringnet over time; there may be problematic materials or problematic details that should be noted on these older bridges.

- Long Service Life (Years of service > 75) – In addition to material standards, these bridges have been subjected to more loading cycles increasing the likelihood of fatigue issues.

- High ADTT (NBI Item 29 ≥ 5000)– Bridge is subject to more loading cycles and potentially more overweight traffic increasing the likelihood of fatigue issues.

- Retrofits and repairs – Has the potential to introduce problematic details and poor welding techniques, may be an indication that the bridge has a history of structural problems.

Equipment

At a minimum the inspector should have a dye penetrant kit and magnifying glass on-hand. Lighting to ensure details are visible may also be necessary on some bridges. Equipment necessary to access FCM's such as ladder, UBIT or climbing equipment should be listed on the FC report.

In some cases it may be appropriate for the inspector to recommend using additional NDT equipment such as magnetic particle, ultrasonic, eddy current, acoustic emission, and radiography to evaluate a detail, particularly if there are known defects or past history of problems with the detail on the bridge. Additional NDT equipment usually requires additional supporting resources such as a generator or personnel with expertise using this equipment. Additional NDT testing shall be at the discretion of the BAME.

The recommendation for additional NDT testing should be in the NOTES section of the routine inspection report. If additional NDT testing is necessary for future FC inspections in order to monitor an issue, the bridge's unique procedures should describe where (what portion of the FCM) and at what frequency (how often) these defects are to be inspected with these additional tools. This is to inform future inspectors of the tools they will need to properly evaluate the FCMs on the bridge during future FC inspections.

Fracture Critical Report

An annotated Fracture Critical Inspection Summary form can be found in *Appendix 4.2*, an example Fracture Critical Inspection Report can be found in *Appendix 4.3*. At a minimum the FC report should include:

- a schematic of the superstructure with all FCM's and unique features (if feasible) identified

- equipment required to properly access and assess FCMs (access equipment required is a dropdown menu on FC summary)

- Sketches or annotated design plans showing FCM members to be visually monitored over time

- A description and condition of each FCM inspected

- Procedures necessary to inspect FCMs including:

    - a reference to the general procedures of article 4.2.5.5

    - any procedures to monitor risk factors listed in table 4.2.5.5-1

    - any hazards or other challenges to properly access FCMs

**4.2.5.6—Underwater Inspection Procedure**

Each underwater inspection has procedures that are unique to the bridge as part of the inspection report. Procedures should include:

- a description of underwater elements to be inspected
- scour countermeasures, if any, to be inspected
- inspection methods, frequencies, other scheduling considerations
- equipment needed for the inspection
- access points
- hydraulic features affecting the structure and/or inspection
- risk factors

At the conclusion of every dive, the diver must go over the inspection findings with the team leader in order to verify that the notes taken by staff on the surface are a correct representation of what the diver found. The diver should also go over all underwater photos, making sure that the photo numbers and descriptions are correct.

One channel cross section upstream of the bridge shall be performed on each underwater inspection. An example of an underwater inspection report is included as *Appendix 4.4*. An example of a channel cross section is included in *Appendix 4.1*.

**4.2.5.8—Damage Inspection Procedure**

The scope of damage inspections varies widely depending on upon the extent of the damage, the volume of traffic encountered, the location of the damage on the structure, and documentation needs. At a minimum, photographs and measurements shall be taken to show the extent of damage.

The inspector shall obtain sufficient information for the BAME to accurately assess the condition of bridge and determine a course of action. Potential courses of action include but are not limited to:

- placement of emergency load restrictions
- partial or full closure of the bridge to traffic
- repairs

For scour critical bridges, ITD utilizes a proprietary alert system BridgeWatch™. BridgeWatch™ takes rain, snow, and stream gauge data into account to determine when there is a potential for high flows. If it is determined that a high flow has occurred or is occurring at a scour critical bridge, a damage assessment (see *Article 4.2.3.7.1*) or inspection may be required to assess possible damage.

A damage inspection should be recorded on the non-SI&A inspection form. A blank non-SI&A inspection form is included as *Appendix 4.7*.

**4.2.5.9—Critical Deficiency (Finding) Procedures**

*4.2.5.9.1 –Critical Finding Definition*

A critical finding is any one or more of the following conditions:

1. A maintenance recommendation with an emergency priority assigned by the bridge inspector

2. Any of the following NBI items are a 2 or less:
   a) Item 58 (Deck)
   b) Item 59 (Superstructure)
   c) Item 60 (Substructure)[1]

3. Any of the following NBI items are a 3 or less:
   a) Item 61 (Channel and Channel Protection)
   b) Item 62 (Culverts)

4. Item 41 (Structure Status) = B

5. Any event causing immediate concern to the traveling public, e.g., a bridge hit, flood, earthquake, etc.

6. When a bridge has a significant structural problem that requires an emergency load restriction, lane closure, bridge closure, or if a bridge has failed.

*4.2.5.9.2—Critical Finding Reporting*

The Inspection Team Leader shall notify the bridge owner/district personnel of all critical findings immediately. Due to the urgent nature, notification may be initially done through a phone call, meeting, or an email. However, formal notification shall occur shortly thereafter by completing and sending a Local Agency Communication Verification (see *Appendix 4.8* for blank form) to local bridge owners or a Critical Finding Communication (see *Appendix 4.9* for blank form) to appropriate ITD personnel. The purpose of these forms is to provide added visibility and attention for bridge owners/district personnel so that they can quickly and diligently take actions to resolve. Typically the Local Agency Communication Verification will be shared and signed at the initial meeting with the bridge owner.

A complete list of highway officials is contained in the *Directory of Idaho Government Officials* published yearly by the Association of Idaho Cities, www.idahocities.org

In addition to completing these forms, the following information shall be documented in the Notes section of the inspection report:

1. a brief summary of the critical finding

2. contact information for the bridge owner representative (name, title, phone number, etc.)

3. date of conversation with bridge owner representative

4. brief summary of interim actions that were/are to be taken, e.g., bridge closure, lane restriction, load posting

5. assign a priority (2 days, 10 days, 30 days)

The inspector shall inform the bridge owner or district personnel that the Bridge Asset Management office must be notified when repairs are completed.

*4.2.5.9.3– Emergency Notification to Police and Public*

If the inspector determines that there is an immediate danger to the traveling public, state or local law enforcement and the BAME shall be contacted immediately. The bridge shall be closed. If the bridge is owned by the state, it shall be closed in accordance with the *ITD Maintenance Manual, Article 322.03*.

[1] If Item 60 is a 2 because Item 113 (Scour Critical Bridges) = 2: An initial Critical Finding notification shall be made. Subsequent Critical Finding notifications shall be made every five years, rather than yearly. The bridge shall be monitored with BridgeWatch™, an online scour critical bridge monitoring system.

*4.2.5.9.4 – Critical Finding Procedures for ITD Maintained Structures*

When a critical finding(s) is discovered during the inspection of a state-owned structure, the following procedure shall be followed:

1. Notification: In addition to the immediate notification described in *Article 4.2.5.9.2*, a completed Critical Findings Communications form shall be sent to the District Engineer and Maintenance Engineer within 24 hours of discovery of the critical finding. Copy the BAME and the Database Manager when sending Critical Findings Notification Forms to the Districts.

2. Action: The District Engineer or designee shall be required to perform the necessary actions within the prescribed timeframes on the form. A representative from the District is required to notify the Database Manager when proper action has been taken. Once BAM is notified, the BrM™ database shall be updated to reflect the current bridge condition.

3. Follow Up: If BAM is not notified that necessary actions were taken within the required timeframes, the District shall be contacted again by either e-mail or phone. The bridge shall be added to the Critical Deficiency Tracking System and continue to be monitored. If after two attempts BAM is unable to obtain confirmation from the District Engineer or designee that the necessary actions were taken, then the BAME will escalate the matter to the Chief of Operations.

All correspondence between the District and the Bridge Asset Management office should be documented in the bridge file. The date and brief summary of repairs that were made, or are scheduled to be made, shall be documented if it is not detailed in the correspondence.

The BrM™ Database Manager shall forward copies of the critical findings inspection reports and local agency communication verifications to the Bridge Asset Management Engineer, the Bridge Design Engineer, and the FHWA Division Bridge Engineer monthly.

*4.2.5.9.5 – Critical Finding Procedures for Locally Owned Structures*

When a critical finding(s) is discovered during the inspection of a locally-owned structure, the following procedures shall be followed:

1. Notification: In addition to the immediate notification described in *Article 4.8.1.4.2*, a completed Local Agency Communication Verification form shall be sent to the local agency within 24 hours of discovery of the critical finding. Copy the BAME and the Database Manager when sending Critical Findings Notification Forms to local agencies.

2. Action: The local agency shall be required to perform the necessary actions within the prescribed timeframes on the form and contact the Database Manager when proper action has been taken. Once BAM is notified, the BrM™ database shall be updated to reflect the current bridge condition.

3. Follow Up: If the local agency fails to notify BAM within the timeframes identified above, a follow-up letter shall be sent by the BAM Engineer. At this point the bridge shall be added to the Critical Deficiency Tracking System. If the local agency fails to notify BAM within 5 business days that corrective action has been taken, a second follow-up letter shall be sent by the Chief Engineer or designee. This letter shall inform the local agency that Federal and State funds may be suspended until appropriate corrective actions are taken. The FHWA Division Administrator and LHTAC shall be copied on the letter in addition to appropriate ITD personnel. Additionally, the appropriate ITD District Engineer shall be contacted and either he/she or designee shall follow-up with local highway agency personnel and offer assistance to get proper action taken.

*4.2.5.9.6 – Critical Findings Tracking System*

ITD shall maintain a system that tracks all critical findings. When a critical finding has been resolved, the tracking system shall be updated to indicate the critical finding has been closed. A historical record of resolved critical findings shall be maintained in order to track the types of critical findings found and to identify other bridges which may have similar structural details. At the discretion of the Program Manager, inspection of other bridges with similar structural details may be scheduled to verify that the critical finding is isolated to the identified bridge(s).

**4.2.5.10—Procedure for Scour Evaluation of Bridges Recently Added to the Inventory**

As part of federal requirements, all new bridges designed and constructed with federal funds must be assessed for their scour vulnerability during the design phase according to HEC 18 and therefore are assumed to be low risk for failure due to scour, i.e. Item 113 = 8 unless inspection findings show otherwise. For new non-federal aid bridges and existing bridges recently added to Idaho's inventory the following process will occur:

- At least once every two months, the Special Projects Engineer will obtain a report from the bridge inspection database of all bridges that haven't been evaluated for scour, i.e. Item 113 = 6.

- This set of bridges will be screened according to the flow chart located in *Appendix 4.10* and a new code for Item 113 may be assigned.

- If the Scour Committee is unable to properly assess the bridge, it will be assigned to a consultant engineer for a complete scour evaluation.

Assessments that can be done by the Scour Committee will be completed within 90 days of the database inquiry. In an effort to control costs and understanding that site visits to a bridge are best performed at certain times of the year, ITD anticipates that a consultant evaluation can take up to one year after the initial screening by the Scour Committee. Bridges that are being evaluated for scour by a consultant will be considered scour critical and added to the BridgeWatch™ system until the evaluation is completed.

**4.2.5.11—Unknown Foundations Procedure**

ITD utilizes all its resources, e.g., plan archives, inspection files, design files, and local highway district contacts to locate plans for each bridge in the inventory. However in some cases, primarily with local bridges, plans cannot be located. Without foundation drawings, appropriate calculations for scour evaluations cannot be made. Item 113 (Scour Critical Bridges) is coded a U for bridges with unknown foundations. This coding is primarily used when it cannot be determined if a bridge's foundations are spread footings or piles. If the foundation type can be determined by routine or underwater inspection, Item 113 shall be changed to the appropriate code.

ITD has developed a flow chart (see *Appendix 4.11*), based on a select number of NBI items, to determine whether an unknown foundation bridge is at high or low risk for failure during a flooding event. A bridge is categorized as low risk if it has performed well, has a low ADT, short detour length and has no history of significant scour related problems. High risk infers that the bridge has performed satisfactorily, but because of ITD defined criteria and experiences, a higher level of scrutiny is needed.

The risk category for an unknown foundation bridge is based on the following NBI items:

- Item 71 - Waterway Adequacy

- Item 61 - Channel and Channel Protection

- Item 45 - Number of Main Spans

- Item 46 - Number of Approach Spans

- Item 19 - Detour Length

- Item 29 – ADT

Failure risk for unknown foundation bridges with four or more spans shall be determined by the scour committee on a case-by-case basis since potential risk factors for multi-spans may not be adequately represented in the above NBI items.

A plan-of-action (POA) shall be developed for all unknown foundation bridges. BrM™ is the Department's filing location (electronic only) for scour POA's. Each POA shall be electronically linked to the bridge record in BrM™. All other scour related documents (if applicable) shall be retained in the bridge file.

**High Risk**

A bridge shall be categorized as high risk if it meets one of the following criteria:

1. The bank and/or protection is undermined or if overtopping of the bridge deck is possible (Waterway Adequacy or Channel Protection < 5).

2. The bridge has 2 or 3 spans, bank and/or protection is beginning to slump or erode, and overtopping is a slight possibility (Waterway Adequacy and Channel Protection < 7).

3. The bridge has one span, bank and/or protection is beginning to slump or erode, overtopping is a slight possibility, ADT is greater than 100, and the detour length is greater than 10 miles (Waterway Adequacy and Channel Protection < 7 and Detour Length > 10 and ADT > 100).

4. The Scour Committee has determined that exhibited scour warrants High Risk monitoring. Undermining is minimal and foundation type is unable to be determined.

High risk unknown foundation bridges shall be monitored on the BridgeWatch™ system in addition to their routine and/or underwater inspections at frequencies specified in *Article 4.2.4.2 – Routine Inspection Interval* and *Article 4.2.4.5 – Underwater Inspection Interval*

A high risk POA is similar to those for bridges determined to be scour critical. At a minimum, each high risk bridge is monitored in BridgeWatch™. BridgeWatch™ utilizes real-time data to continuously monitor bridge sites for local conditions that may increase the likelihood of a scour event occurring (high stream flow, heavy rainfall, etc.).

In addition to BridgeWatch™, additional monitoring occurs during routine and underwater (if applicable) inspections and after major flood events. The bridge inspector shall review high risk bridge POAs with the bridge owner(s) at least once every five years or more frequently if significant scour is observed by the inspector. Inspectors shall review and consider the POA as they perform bridge inspections.

Based on information in bridge inspection reports and feedback from bridge inspectors and bridge owners/maintenance personnel, the Scour Committee may make recommendations to the bridge owner for:

- foundation investigation
- countermeasure installation
- programming for bridge replacement (usually if significant scour occurs or recurs frequently)

**Low Risk**

Low risk unknown foundation bridges shall be monitored by routine and/or underwater inspections at frequencies specified in *Article 4.2.4.2 – Routine Inspection Interval* and *Article 4.2.4.5 – Underwater Inspection Interval*.

The POA for a low risk bridge shall describe an ongoing monitoring plan. Monitoring typically occurs during routine biennial inspections and after major flood events. The POA shall be sent to the bridge owner once every five years. Inspectors shall review and consider the POA as they perform bridge inspections. Inspectors may make a recommendation to the Scour Committee to re-assign a low risk bridge to high risk if field conditions warrant. The inspection report shall document findings and other pertinent information that the Scour Committee should consider for reassignment.

Additional Information:

- FHWA memo 1/9/2008: Technical Guidance for bridges over waterways with unknown foundations
- FHWA memo 6/3/2009: FAQs - Bridges over waterways with unknown foundations
- FHWA memo 10/29/2009: Additional Guidance for assessment of bridges over waterways with unknown foundations

#### 4.2.5.12 – Procedure for Scour Critical or High Risk Unknown Foundation Bridges Over Canals

Bridges over irrigation canals that have been determined to be scour critical or a high risk unknown foundation shall not be placed on BridgeWatch. Inspection frequency and Plan of Actions will be the same as other scour critical or high risk unknown foundation bridges. BridgeWatch utilizes the bridges drainage basin to determine if an over-threshold rainfall or snowmelt event is occurring. Canals have no natural drainage basin so an alert will never occur.

## 4.3—NONREGULATORY INSPECTION PRACTICES

### 4.3.6—Complex Bridge Inspections

Complex bridge inspections are required on bridges that include details such as moving parts, cable suspension, or eyebar-chain suspension systems. These complex details require individual inspection procedures that are not typically inspected with sufficient scrutiny in the routine inspection. The complex bridges in Idaho and their inspection procedures are included in below. Complex bridge inspections shall be on the same inspection frequency as routine inspections.

The *Code of Federal Regulations [CFR 650.313(f)]* requires state agencies to "Identify specialized inspection procedures and additional inspector training and experience required to inspect complex bridges according to those procedures." Inspectors should review the inspection procedures specific to a complex bridge prior to completing an inspection on these bridges. ITD does not maintain a special staff for inspection of complex bridges. The procedures for all complex bridges inspected by ITD are linked in BrM™.

#### 4.3.6.1—Movable Bridges

Idaho has the following lift bridge:

*Snake River (Br. Key 10360), US 12, in Lewiston at State Line*

This is a border bridge shared with Washington. Washington Department of Transportation is responsible for the development of inspection procedures and inspection of this bridge.

#### 4.3.6.2—Suspension Bridges

Cable suspended structures contain fracture critical members and fatigue-prone details, and the inspection of those components are specifically covered in those types of inspections. The intent of the inspection of these complex details is to identify the structural geometry and the different load paths in order to assure that the structure is functioning as originally designed. The two distinct load paths consist of the cable suspension system back to the cable anchorages, along the stiffener truss, and down the interior piers. Over time, the cable suspension system shall relax or the interior bents can settle, transferring more of the load into these components. This inspection shall assess whether that load transfer is still within tolerable limits.

Idaho has the following suspension bridge:

*Dent Bridge (Br. Key 20295), N. Fork Clearwater River, STC 4783, 8.8 N. 3.7 E. Orofino*

#### 4.3.6.3—Cable-Stayed Bridges

Idaho does not have any publicly owned cable-stayed vehicular bridges.

#### 4.3.6.4—Tied Arch Bridges

ITD does not consider these bridge types to be complex. Follow routine and applicable fracture critical inspection procedures.

#### 4.3.6.5—Prestressed Concrete Segmental Bridges

ITD does not consider these bridge types to be complex. Follow routine inspection procedures.

## 4.4—REFERENCES

Code of Federal Regulations

AASHTO Manual for Bridge Evaluation Second Edition, 2014

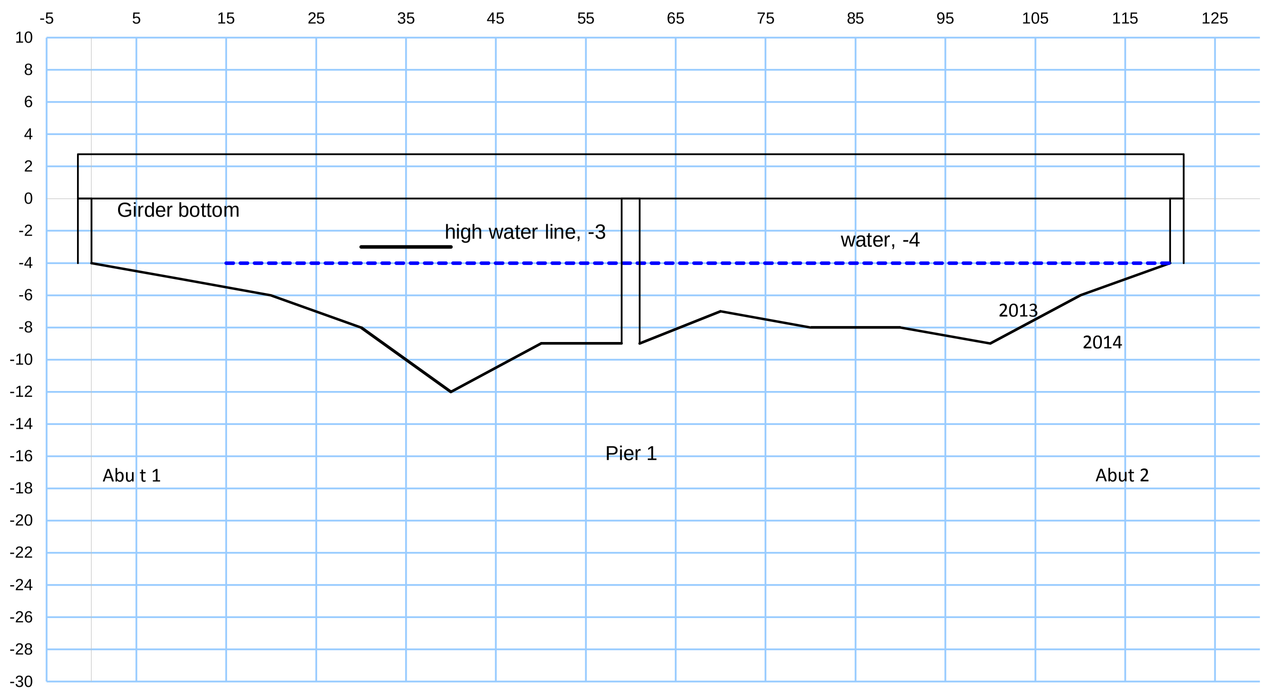
FHWA manual “Inspection of Fracture Critical Bridge Members” (FHWA-IP-86-26)

The ‘‘Recording and Coding Guide for Structure Inventory and Appraisal of the Nation’s Bridges,’’

December 1995, Report No. FHWA–PD–96–001, *http//www.fhwa.dot.gov//bridge/mtguide.doc*

**"Your Company Name"**
**Bridge Key: 99999**
**Channel Cross-Section**

11/30/2012 "Inspector name"




**Upstream Channel Cross Section**
Side view looking southwest

*Note: Horizontal and vertical scales in feet*

99999_XS_1112.pdf
Page 1 of 1

| | |
|---|---|
| Bridge: | Bridge Key: 99999 |
| Date: | 11/30/2012 |
| Datum: | Girder bottom |
| Direction: | Side view looking southwest |
| File: | 99999_XS_1112.pdf |
| Pages: | Page 1 of 1 |

| station | distance | water | |
|---|---|---|---|
| 0 | -4 | 15 | -4 |
| 10 | -5 | 120 | -4 |
| 20 | -6 | high water line | |
| 30 | -8 | 30 | -3 |
| 40 | -12 | 40 | -3 |
| 50 | -9 | Girder bottom | |
| 59 | -9 | -1.5 | 0 |
| | | 121.5 | 0 |
| 61 | -9 | 121.5 | 2.75 |
| 70 | -7 | -1.5 | 2.75 |
| 80 | -8 | -1.5 | 0 |
| 90 | -8 | Abut 1 | |
| 100 | -9 | -1.5 | -4 |
| 110 | -6 | -1.5 | 0 |
| 120 | -4 | 0 | 0 |
| | | 0 | -4 |
| | | Abut 2 | |
| | | 120 | -4 |
| | | 120 | 0 |
| | | 121.5 | 0 |
| | | 121.5 | -4 |
| | | Pier 1 | |
| | | 59 | -9 |
| | | 59 | 0 |
| | | 61 | 0 |
| | | 61 | -9 |
| | | | 0 |
| | | 0 | |

# IDAHO TRANSPORTATION DEPARTMENT
# FRACTURE CRITICAL INSPECTION REPORT

## FRACTURE CRITICAL BRIDGE
## INSPECTION SUMMARY SHEET

| | |
|---|---|
| Features | NBI 6A |
| Bridge Key: | 5 digit bridge key |
| Structure Name | Structure number with milepost |
| Owner: | Adminstrative Jurisdiction |
| Route: | NBI 7 |
| Milepost: | NBI11 |
| Equipment Required: | dropdown menu |
| Preparation Notes: | May include traffic control, access requirements, whom to notify for upcoming inspections |

Equipment Required Dropdown Menu:
- Stepladder
- Ladder
- Extension ladder
- Climbing equipment
- Under Bridge Inspection Truck (UBIT)
- Scissor Lift
- Other (please specify)

Inspection Procedures: (Should be specific to the bridge and discuss relevent risk factors)

Includes relevent risk factors from *IMBE table 4.2.5.5-1* , hazards or other challenges to properly access FCM's, or anything else unique to inspecting this structure. General procedures listed in *IMBE article 4.2.5.5* do not need to be listed here.

FCM Types:
- Two Girder System
- Splice Plates
- Floorbeams
- Box Beams
- Rigid Frames
- Truss Tension Members (horizontal, vertical, diagonal)
- Connection Pins
- Arch Tension Members (horizontal, vertical, diagonal)
- Pin and Hanger Assemblies

Fabrication Methods:
- Rolled
- Riveted
- Bolted
- Welded
- Forged Eyebars

| FCM Location | FCM type (Fabrication Method), optional decription | FCM Per Span and Type |
|---|---|---|
| Span 1 | Horizontal truss tension members (bolted), bottom chord L0-L0' | 8 |
| | Vertical truss tension members (riveted) | 6 |
| | Diagonal truss tension members (welded) | 4 |
| | Gusset plates (rolled), interior & exterior | 16 |
| | Floor beams (bolted), FB0 - FB4 | 5 |
| | | |
| Span 2 | Diagonal truss tension members (forged eyebars), bottom chord L0-L0' | 4 |
| | Vertical truss tension members (riveted) | 2 |
| | Gusset plates (welded, riveted) | 4 |
| | Connection pins (rolled) | 6 |
| | Floor beams (bolted), FB5 - FB7 | 3 |
| | | |
| Span 3 | Two-girder system (welded), with milepost girder 1 (left) & 2 (right) | 2 |
| | Splice plates (bolted) | 2 |
| | Pin and hanger assemblies (welded) | 2 |
| | | |
| Span 4 | Horizontal arch tension member (bolted), bottom chord tie girder, 1 (left) & 2 (right) | 2 |
| | Cable support systems (Other - wire strand), vertical suspenders #1-9 | 18 |
| | Floorbeams (welded), L0-L10 | 11 |
| | | |
| | | |



Note: FCM = Fracture Critical Member

***Fracture Critical Inspections are always done in conjunction with a routine inspection. Please see corresponding routine inspection report for FC inspection frequency, next scheduled inspection, and any follow up procedures.**

**IDAHO TRANSPORTATION DEPARTMENT**
**FRACTURE CRITICAL INSPECTION REPORT**

**FRACTURE CRITICAL BRIDGE**
**INSPECTION SUMMARY SHEET**

| | | | |
|---|---|---|---|
| Features | Payette River | Inspection Date: | xx/xx/xxxx |
| Bridge Key: | 26680 | Drawing #: | 17195 |
| Structure Name | X993080 100.32 | | |
| Owner: | Boise County | | |
| Route: | Boise Street | | |
| Milepost: | 100.320 | | |

Equipment Required: Climbing gear, ladder, scaffold
Preperation notes: Climbing equipment needed to access floor beams

Inspection Procedures: (Should be specific to the bridge and discuss relevent risk factors)

1 Inspect according to General procedures in IMBE 4.2.5.5.
2 Bridge is >100 yrs old with unknown design load, unknown history of vehicle loading, unknown steel alloys in tension members.
3 Emphasis on the eyebars - particularly the forged area around the eyebar head and shank looking for cracks.
4 Check the misaligned eyebars for evidence of substructure movement, impact damage, and/or unitended force reversal.
5 Emphasis on the misaligned eyebars as they may cause uneven and excessive loading on adjacent members.
6 Check pins for signs of wear and corrosion. Recommend UT on a sample of pins periodically to check for internal flaws.
7 Check spacers on pin assemblies to ensure members are being held in their proper positions.
8 Emphasis on the misaligned pin. This is creating a single shear (double the intended load) concentration on the pin.

| FCM Location | FCM Type | FCM Per Girder or Truss Line |
|---|---|---|
| Span 1 | Horizontal Truss Tension Members (forged eyebar), L0 - L7 | 10 |
| Span 1 | Diagonal Truss Tension Members (forged eyebar) | 12 |
| Span 1 | Floorbeams (rolled) | 4 |
| Span 1 | Connection Pins (rolled) | 13 |
| Span 2 | Horizontal Truss Tension Members (forged eyebar), L0 - L7 | 10 |
| Span 2 | Diagonal Truss Tension Members (forged eyebar) | 12 |
| Span 2 | Floorbeams (rolled) | 4 |
| Span 2 | Connection Pins (rolled) | 13 |
| | | |
| | | |
| | | |
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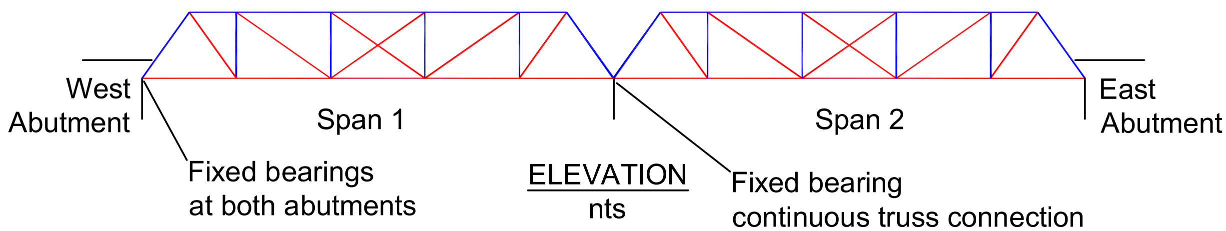
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

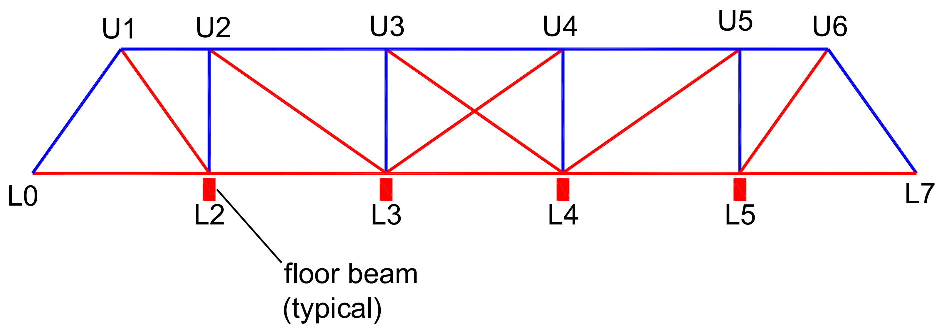
Note: FCM = Fracture Critical Member

***Fracture Critical Inspections are always done in conjunction with a routine inspection. Please see corresponding routine inspection report for FC inspection frequency, next scheduled inspection, and any follow up procedures.**

BK# 26680
X993080 100.32
PAYETTE RIVER
PRATT PONY TRUSS
2 SPAN, 182 FT TOTAL
MAX SPAN 91 FEET




ELEVATION
nts

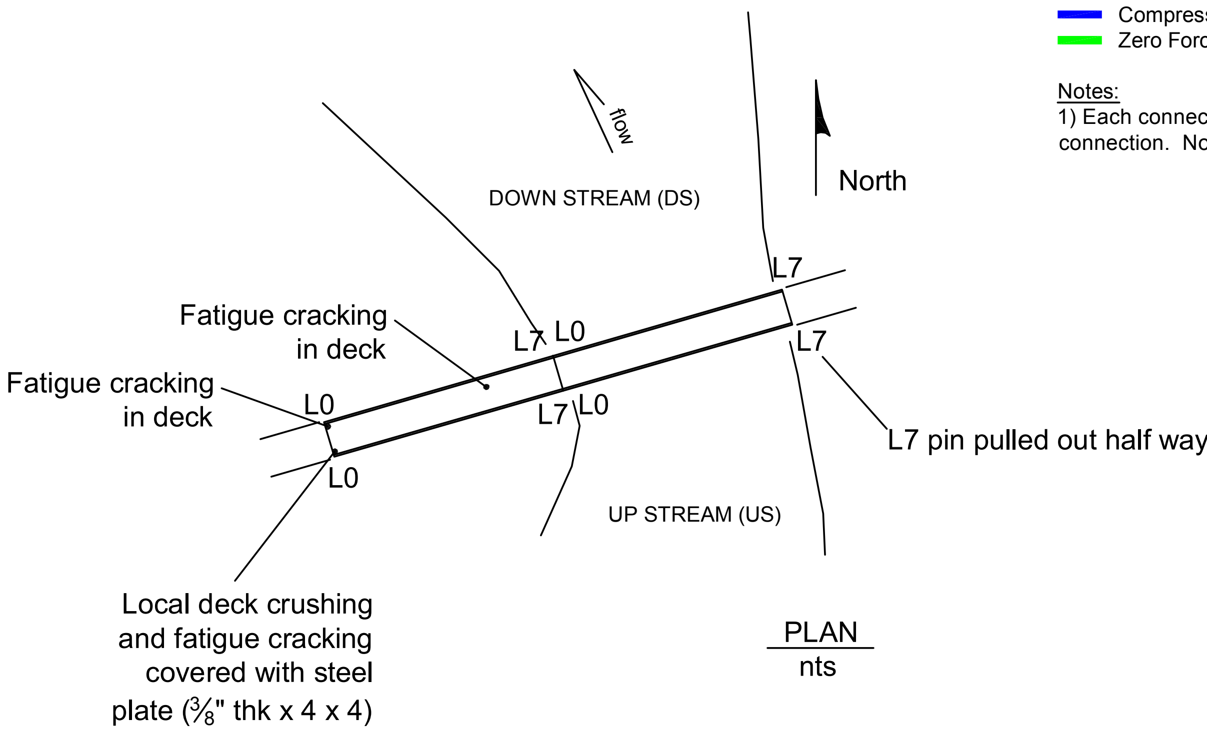



TRUSS NAMING CONVENTION
nts

Legend

- Tension Member (FCM's)
- Compression Member
- Zero Force Member

Notes:
1) Each connection is a pinned connection. No Gusset Plates.




PLAN
nts

**IDAHO TRANSPORTATION DEPARTMENT**
**FRACTURE CRITICAL INSPECTION REPORT**

Features: Payette River — FC Inspection Date: 8/20/2015
Bridge Key: 26680 — Hours: 1.5
Structure Name: X993080 100.32
Owner: Boise County — Inspector: David Hughes
Route: Boise Street — Co-Inspector:
Milepost: 100.320

| Truss/ Girder | Span | Location | FCM Inspected | Detail Description | Inspection Method | Surface Preparation | Remarks |
|---|---|---|---|---|---|---|---|
| South - US | 1 | L0 - L2 | Bottom Chord | Double bar, forged ends | V | NO | Heavy rusting, moderate pitting |
| South - US | 1 | L2 - L3 | Bottom Chord | Double bar, forged ends | V | NO | Heavy rusting, moderate pitting |
| South - US | 1 | L3 - L4 | Bottom Chord | Double bar, forged ends | V | NO | Heavy rusting, moderate pitting |
| South - US | 1 | L4 - L5 | Bottom Chord | Double bar, forged ends | V | NO | Heavy rusting, moderate pitting |
| South - US | 1 | L5 - L7 | Bottom Chord | Double bar, forged ends | V | NO | Heavy rusting, moderate pitting |
| South - US | 1 | L2 - U1 | Diagonal | Double bar, forged ends | V | NO | Heavy rusting, moderate pitting |
| South - US | 1 | L3 - U2 | Diagonal | Double bar, forged ends | V | NO | Heavy rusting, moderate pitting. Exterior bar bent approximately 1" |
| South - US | 1 | L3 - U4 | Diagonal | Single bar, forged ends w/ turn buckle | V | NO | Heavy rusting, moderate pitting |
| South - US | 1 | L4 - U3 | Diagonal | Single bar, forged ends w/ turn buckle | V | NO | Heavy rusting, moderate pitting |
| South - US | 1 | L4 - U5 | Diagonal | Double bar, forged ends | V | NO | Heavy rusting, moderate pitting. Slightly bent |
| South - US | 1 | L5 - U6 | Diagonal | Double bar, forged ends | V | NO | Heavy rusting, moderate pitting |
| South - US | 1 | L6 - U7 | Diagonal | Double bar, forged ends | V | NO | Heavy rusting, moderate pitting |
| South - US | 1 | L0 | Pin | | V | NO | Heavy rusting and pitting |
| South - US | 1 | L2 | Pin | | V | NO | Heavy rusting and pitting |
| South - US | 1 | L3 | Pin | | V | NO | Heavy rusting and pitting |
| South - US | 1 | L4 | Pin | | V | NO | Heavy rusting and pitting |
| South - US | 1 | L5 | Pin | | V | NO | Heavy rusting and pitting |
| South - US | 1 | L7 | Pin | | V | NO | Heavy rusting and pitting |

**IDAHO TRANSPORTATION DEPARTMENT**
**FRACTURE CRITICAL INSPECTION REPORT**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| South - US | 1 | U1 | Pin | | V | NO | Moderate rusting and pitting |
| South - US | 1 | U2 | Pin | | V | NO | Moderate rusting and pitting |
| South - US | 1 | U3 | Pin | | V | NO | Moderate rusting and pitting |
| South - US | 1 | U4 | Pin | | V | NO | Moderate rusting and pitting |
| South - US | 1 | U5 | Pin | | V | NO | Moderate rusting and pitting |
| South - US | 1 | U6 | Pin | | V | NO | Moderate rusting and pitting |
| South - US | 1 | U7 | Pin | | V | NO | Moderate rusting and pitting |
| North - DS | 1 | L0 - L2 | Bottom Chord | Double bar, forged ends | V | NO | Heavy rusting, moderate pitting |
| North - DS | 1 | L2 - L3 | Bottom Chord | Double bar, forged ends | V | NO | Heavy rusting, moderate pitting |
| North - DS | 1 | L3 - L4 | Bottom Chord | Double bar, forged ends | V | NO | Heavy rusting, moderate pitting. Both bars slightly twisted |
| North - DS | 1 | L4 - L5 | Bottom Chord | Double bar, forged ends | V | NO | Heavy rusting, moderate pitting |
| North - DS | 1 | L5 - L7 | Bottom Chord | Double bar, forged ends | V | NO | Heavy rusting, moderate pitting |
| North - DS | 1 | L2 - U1 | Diagonal | Double bar, forged ends | V | NO | Heavy rusting, moderate pitting |
| North - DS | 1 | L3 - U2 | Diagonal | Double bar, forged ends | V | NO | Heavy rusting, moderate pitting. Inner bar twisted & slightly bent |
| North - DS | 1 | L3 - U4 | Diagonal | Single bar, forged ends w/ turn buckle | V | NO | Heavy rusting, moderate pitting |
| North - DS | 1 | L4 - U3 | Diagonal | Single bar, forged ends w/ turn buckle | V | NO | Heavy rusting, moderate pitting |
| North - DS | 1 | L4 - U5 | Diagonal | Double bar, forged ends | V | NO | Heavy rusting, moderate pitting. Exterior bar slightly bent. |
| North - DS | 1 | L5 - U6 | Diagonal | Double bar, forged ends | V | NO | Heavy rusting, moderate pitting |
| North - DS | 1 | L6 - U7 | Diagonal | Double bar, forged ends | V | NO | Heavy rusting, moderate pitting |
| North - DS | 1 | L0 | Pin | | V | NO | Heavy rusting and pitting |
| North - DS | 1 | L2 | Pin | | V | NO | Heavy rusting and pitting |
| North - DS | 1 | L3 | Pin | | V | NO | Heavy rusting and pitting |

**IDAHO TRANSPORTATION DEPARTMENT**
**FRACTURE CRITICAL INSPECTION REPORT**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| North - DS | 1 | L4 | Pin | | V | NO | Heavy rusting and pitting |
| North - DS | 1 | L5 | Pin | | V | NO | Heavy rusting and pitting |
| North - DS | 1 | L7 | Pin | | V | NO | Heavy rusting and pitting |
| North - DS | 1 | U1 | Pin | | V | NO | Moderate rusting and pitting |
| North - DS | 1 | U2 | Pin | | V | NO | Moderate rusting and pitting |
| North - DS | 1 | U3 | Pin | | V | NO | Moderate rusting and pitting |
| North - DS | 1 | U4 | Pin | | V | NO | Moderate rusting and pitting |
| North - DS | 1 | U5 | Pin | | V | NO | Moderate rusting and pitting |
| North - DS | 1 | U6 | Pin | | V | NO | Moderate rusting and pitting |
| North - DS | 1 | U7 | Pin | | V | NO | Moderate rusting and pitting |
| North - South | 1 | L0 | Floor Beam | I- beam | V | NO | Heavy rusting, moderate pitting at connections. Heavy staining from moisture seepage |
| North - South | 1 | L2 | Floor Beam | I- beam | V | NO | Heavy rusting, moderate pitting at connections. Heavy staining from moisture seepage |
| North - South | 1 | L3 | Floor Beam | I- beam | V | NO | Heavy rusting, moderate pitting at connections. Heavy staining from moisture seepage |
| North - South | 1 | L4 | Floor Beam | I- beam | V | NO | Heavy rusting, moderate pitting at connections. Heavy staining from moisture seepage |
| North - South | 1 | L5 | Floor Beam | I- beam | V | NO | Heavy rusting, moderate pitting at connections. Heavy staining from moisture seepage |
| North - South | 1 | L7 | Floor Beam | I- beam | V | NO | Heavy rusting, moderate pitting at connections. Heavy staining from moisture seepage |
| South - US | 2 | L0 - L2 | Bottom Chord | Double bar, forged ends | V | NO | Heavy rusting, moderate pitting. Slightly bent |
| South - US | 2 | L2 - L3 | Bottom Chord | Double bar, forged ends | V | NO | Heavy rusting, moderate pitting |
| South - US | 2 | L3 - L4 | Bottom Chord | Double bar, forged ends | V | NO | Heavy rusting, moderate pitting |
| South - US | 2 | L4 - L5 | Bottom Chord | Double bar, forged ends | V | NO | Heavy rusting, moderate pitting |
| South - US | 2 | L5 - L7 | Bottom Chord | Double bar, forged ends | V | NO | Heavy rusting, moderate pitting. Interior bar bent 4". Interior bar is very loose. |
| South - US | 2 | L2 - U1 | Diagonal | Double bar, forged ends | V | NO | Heavy rusting, moderate pitting. Slightly bent |

**IDAHO TRANSPORTATION DEPARTMENT**
**FRACTURE CRITICAL INSPECTION REPORT**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| South - US | 2 | L3 - U2 | Diagonal | Double bar, forged ends | V | NO | Heavy rusting, moderate pitting. Interior bar slightly bent. |
| South - US | 2 | L3 - U4 | Diagonal | Single bar, forged ends w/ turn buckle | V | NO | Heavy rusting, moderate pitting |
| South - US | 2 | L4 - U3 | Diagonal | Single bar, forged ends w/ turn buckle | V | NO | Heavy rusting, moderate pitting |
| South - US | 2 | L4 - U5 | Diagonal | Double bar, forged ends | V | NO | Heavy rusting, moderate pitting |
| South - US | 2 | L5 - U6 | Diagonal | Double bar, forged ends | V | NO | Heavy rusting, moderate pitting. Slightly bent |
| South - US | 2 | L6 - U7 | Diagonal | Double bar, forged ends | V | NO | Heavy rusting, moderate pitting |
| South - US | 2 | L0 | Pin | | V | NO | Heavy rusting and pitting |
| South - US | 2 | L2 | Pin | | V | NO | Heavy rusting and pitting |
| South - US | 2 | L3 | Pin | | V | NO | Heavy rusting and pitting |
| South - US | 2 | L4 | Pin | | V | NO | Heavy rusting and pitting |
| South - US | 2 | L5 | Pin | | V | NO | Heavy rusting and pitting |
| South - US | 2 | L7 | Pin | | V | NO | Heavy rusting and pitting. Pulled out on interior side, creating single shear condition. |
| South - US | 2 | U1 | Pin | | V | NO | Moderate rusting and pitting |
| South - US | 2 | U2 | Pin | | V | NO | Moderate rusting and pitting |
| South - US | 2 | U3 | Pin | | V | NO | Moderate rusting and pitting |
| South - US | 2 | U4 | Pin | | V | NO | Moderate rusting and pitting |
| South - US | 2 | U5 | Pin | | V | NO | Moderate rusting and pitting |
| South - US | 2 | U6 | Pin | | V | NO | Moderate rusting and pitting |
| South - US | 2 | U7 | Pin | | V | NO | Moderate rusting and pitting |
| North - DS | 2 | L0 - L2 | Bottom Chord | Double bar, forged ends | V | NO | Heavy rusting, moderate pitting |
| North - DS | 2 | L2 - L3 | Bottom Chord | Double bar, forged ends | V | NO | Heavy rusting, moderate pitting. Exterior bar bent down 5" near L2 |
| North - DS | 2 | L3 - L4 | Bottom Chord | Double bar, forged ends | V | NO | Heavy rusting, moderate pitting |

**IDAHO TRANSPORTATION DEPARTMENT**
**FRACTURE CRITICAL INSPECTION REPORT**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| North - DS | 2 | L4 - L5 | Bottom Chord | Double bar, forged ends | V | NO | Heavy rusting, moderate pitting |
| North - DS | 2 | L5 - L7 | Bottom Chord | Double bar, forged ends | V | NO | Heavy rusting, moderate pitting |
| North - DS | 2 | L2 - U1 | Diagonal | Double bar, forged ends | V | NO | Heavy rusting, moderate pitting |
| North - DS | 2 | L3 - U2 | Diagonal | Double bar, forged ends | V | NO | Heavy rusting, moderate pitting |
| North - DS | 2 | L3 - U4 | Diagonal | Single bar, forged ends w/ turn buckle | V | NO | Heavy rusting, moderate pitting |
| North - DS | 2 | L4 - U3 | Diagonal | Single bar, forged ends w/ turn buckle | V | NO | Heavy rusting, moderate pitting |
| North - DS | 2 | L4 - U5 | Diagonal | Double bar, forged ends | V | NO | Heavy rusting, moderate pitting. Exterior bar bent slightly. |
| North - DS | 2 | L5 - U6 | Diagonal | Double bar, forged ends | V | NO | Heavy rusting, moderate pitting |
| North - DS | 2 | L6 - U7 | Diagonal | Double bar, forged ends | V | NO | Heavy rusting, moderate pitting |
| North - DS | 2 | L0 | Pin | | V | NO | Heavy rusting and pitting |
| North - DS | 2 | L2 | Pin | | V | NO | Heavy rusting and pitting |
| North - DS | 2 | L3 | Pin | | V | NO | Heavy rusting and pitting |
| North - DS | 2 | L4 | Pin | | V | NO | Heavy rusting and pitting |
| North - DS | 2 | L5 | Pin | | V | NO | Heavy rusting and pitting |
| North - DS | 2 | L7 | Pin | | V | NO | Heavy rusting and pitting |
| North - DS | 2 | U1 | Pin | | V | NO | Moderate rusting and pitting |
| North - DS | 2 | U2 | Pin | | V | NO | Moderate rusting and pitting |
| North - DS | 2 | U3 | Pin | | V | NO | Moderate rusting and pitting |
| North - DS | 2 | U4 | Pin | | V | NO | Moderate rusting and pitting |
| North - DS | 2 | U5 | Pin | | V | NO | Moderate rusting and pitting |
| North - DS | 2 | U6 | Pin | | V | NO | Moderate rusting and pitting |
| North - DS | 2 | U7 | Pin | | V | NO | Moderate rusting and pitting |

**IDAHO TRANSPORTATION DEPARTMENT**

**FRACTURE CRITICAL INSPECTION REPORT**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| North - South | 2 | L0 | Floor Beam | I- beam | V | NO | Heavy rusting, moderate pitting at connections. Heavy staining from moisture seepage |
| North - South | 2 | L2 | Floor Beam | I- beam | V | NO | Heavy rusting, moderate pitting at connections. Heavy staining from moisture seepage |
| North - South | 2 | L3 | Floor Beam | I- beam | V | NO | Heavy rusting, moderate pitting at connections. Heavy staining from moisture seepage |
| North - South | 2 | L4 | Floor Beam | I- beam | V | NO | Heavy rusting, moderate pitting at connections. Heavy staining from moisture seepage |
| North - South | 2 | L5 | Floor Beam | I- beam | V | NO | Heavy rusting, moderate pitting at connections. Heavy staining from moisture seepage |
| North - South | 2 | L7 | Floor Beam | I- beam | V | NO | Heavy rusting, moderate pitting at connections. Heavy staining from moisture seepage |

<u>INSPECTION METHODS</u>
(V) VISUAL
(DP) DYE PENTRANT
(UT) ULTRASONIC
(MP) MAGNETIC PARTICLE
(OT) OTHER

<u>SURFACE PREPARATIONS</u>
(NO) NONE
(WB) WIRE BRUSH
(GR) GRINDING
(CE) CHEMICAL
(SB) SAND BLASTING
(CH) CHIPPING HAMMER
(OT) OTHER

**IDAHO TRANSPORTATION DEPARTMENT**
**UNDERWATER INSPECTION REPORT**

**Bridge Key:** 10535 **Structure Name:** 01310A 11.22
**Feature Intersected:** S.F. CLEARWATER RIVER; HARPSTER **Location:** 1.1 S. HARPSTER
**Facility Carried:** SH 13 **Admin Jurisdiction:** 0002
**Macs Seg:** 001960 **Milepost:** 011.215 **District:** 2
**Latitude:** N 45° 57' 33" **Longitude:** W 115° 57' 38" **Owner:** STATE HIGHWAY AGENCY
**County:** 049 IDAHO **Year Built:** 1985

## INSPECTION INFORMATION AND PROCEDURES

Proposed UW Insp. Freq: 60 Previous UW Insp. Freq: N/A Previous UW Insp. Date: N/A

Reason for Proposed Change to UW Insp. Freq: Not Applicable

Items to Inspect: Pier 1

Foundation Type: Steel H-piles

Scour Countermeasures: ☒ Yes ☐ No If Yes, Describe: Large riprap, up to 3 feet in diameter, placed around Pier 1.

Structural Details: RC pier wall supported by steel H-piles.

Plans Available: ☐ General Plan and Elevation ☒ Substructure Unit Details ☐ Repair/Rehabilitation Drawings ☐ No Plans Available

Hydraulic Features & Characteristics: No significant hydraulic features at the bridge.

Inspection Method: ☒ Wet/Dry Suit ☐ Scuba ☐ Surface Supplied Air ☐ Other

Comments: No comments

Inspection Level: ☒ Level I ☒ Level II ☐ Level III

Comments: Level I inspection over 100 percent of each underwater element. Level II inspection over 10 percent of each underwater element.

Specialized Equip: None required

Flow control located upstream or immediately downstream of structure? ☐ Yes ☒ No

Contact to flow control agency required to adequately inspect structure? ☐ Yes ☒ No

Flow Controlling Agency: None

Contact:

Phone:

Bridge Contact:

Phone:

**Team Leader (Print & Sign):** **Inspection Date:**

# IDAHO TRANSPORTATION DEPARTMENT
# UNDERWATER INSPECTION REPORT

**Bridge Key:** 10535 **Feature Intersected:** S.F. CLEARWATER RIVER; HARPSTER

Diver 1 (TL): ______ Diver 3: ______

Diver 2: ______ Diver 4: ______

Diving Hazards:

| | | |
|---|---|---|
| Debris | ☐ Yes | ☒ No |
| Swift Current | ☐ Yes | ☒ No |
| Black Water | ☐ Yes | ☒ No |
| Deep Dive | ☐ Yes | ☒ No |
| Constricted Waterway | ☐ Yes | ☒ No |
| Soft/Unstable Channel Bottom/Banks | ☐ Yes | ☒ No |
| Watercraft/Vessel Movements | ☐ Yes | ☒ No |
| Other: ______ | ☐ Yes | ☒ No |

Describe Diving Hazards:

Not applicable

Boat Required: ☐ Yes ☒ No

Access/Launch Site: Can be accessed from northwest embankment.

Waterline Ref. & Elev: Top of pier cap at Pier 1 at downstream nose (El. 1626.92 ft).

Distance to Waterline: 12.3 ft Waterline Elevation: 1614.6 ft

Time Spent on Insp: 2 hrs

Air Temp: 90° F Weather: Sunny

Water Temp: 70°F Water Visibility: 5 ft

Min. Depth at Substructure Unit(s): 0.4 ft (Pier 1) Max. Depth at Substructure Unit(s): 2.6 ft (Pier 1)

Flow Velocity: 1 ft/sec

Flow Direction: East to West

Inspection Preparation Notes:

Drawings are available but difficult to read.

**IDAHO TRANSPORTATION DEPARTMENT**
**UNDERWATER INSPECTION REPORT**

**Bridge Key:** 10535 **Feature Intersected:** S.F. CLEARWATER RIVER; HARPSTER

## INSPECTION FINDINGS

**GENERAL NOTES (Shoreline Conditions, Channel Conditions, Special Details, Construction Operations, Etc.)**

Embankments typically exhibited moderate slopes, were lightly vegetated with grass, brush, and trees, and exhibited random riprap up to 2 feet in diameter. No evidence of embankment erosion observed.

**UNDERWATER ELEMENT CONDITION STATES**

| | | | | Current Condition State (Gray) /Proposed Condition State (white) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Elem.* | *Description* | *Qty** | *Units* | *1* | | *2* | | *3* | | *4* | |
| 210 | RC Pier Wall | 37 | LF | 28 | 0 | 9 | 18 | 0 | 19 | 0 | 0 |
| | 1080: Spall | 19 | LF | 0 | 0 | 0 | 0 | 0 | 19 | 0 | 0 |
| | 1190: Abrasion/Wear | 18 | LF | 0 | 0 | 0 | 18 | 0 | 0 | 0 | 0 |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
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| | | | | | | | | | | | |

**Remarks on Underwater Element Condition States:**

**210/1080:** Large seam of section loss, most likely due to a cold joint, extending from the downstream 1/4-pt of the south face, around the downstream nose, and up to the midpoint of the north face, with penetrations up to 6 inches and exposed reinforcing steel with up to 25% loss of section.
**210/1190:** Pier wall exhibited a band of scaling all around the pier from the bottom of the concrete to 4 feet above the waterline with 1/4 inch to 1/2 inch penetrations and exposed aggregates around the entire pier wall.

**NBI CODING**

| *Item* | *Current Condition Code* | *Proposed Condition Code* | *Item* | *Current Condition Code* | *Proposed Condition Code* |
|---|---|---|---|---|---|
| 60 (Substructure) | 7 | 6 | 62 (Culvert) | N | N |
| 61 (Channel) | 8 | 8 | 113 (Scour) | 8 | 8 |

**Remarks on NBI Coding:**

60: Observed section loss of the concrete pier wall has significantly increased as compared to most recent above water inspection.

**MAINTENANCE RECOMMENDATIONS**

| *Elem.* | *Description* | *Priority* |
|---|---|---|
| | | |
| | | |
| | | |

***Quantities listed above only represent the portions of the element that were inspected as part of the underwater inspection.**

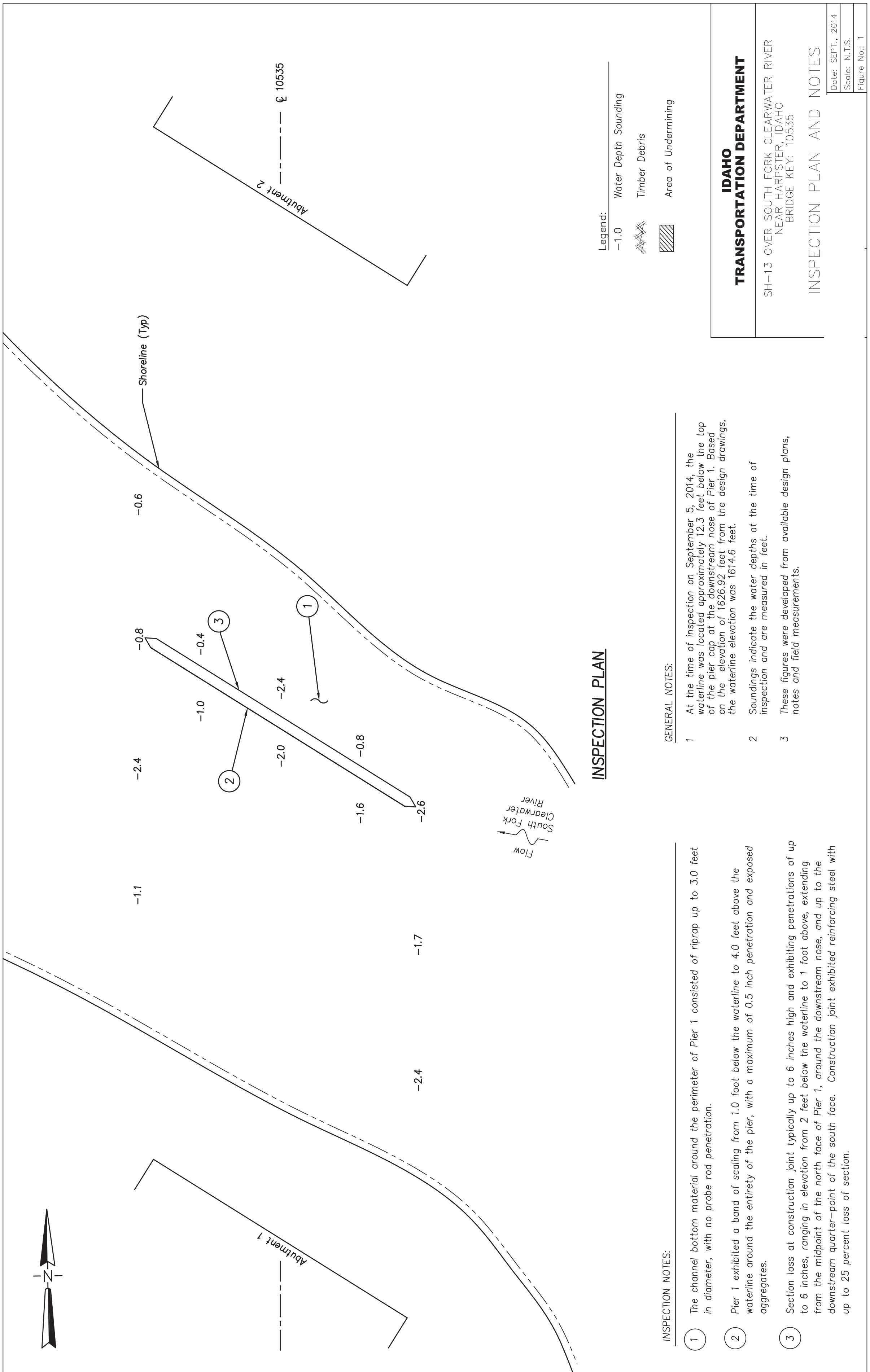
Photograph 1: Overall View of Bridge, Looking Northwest.

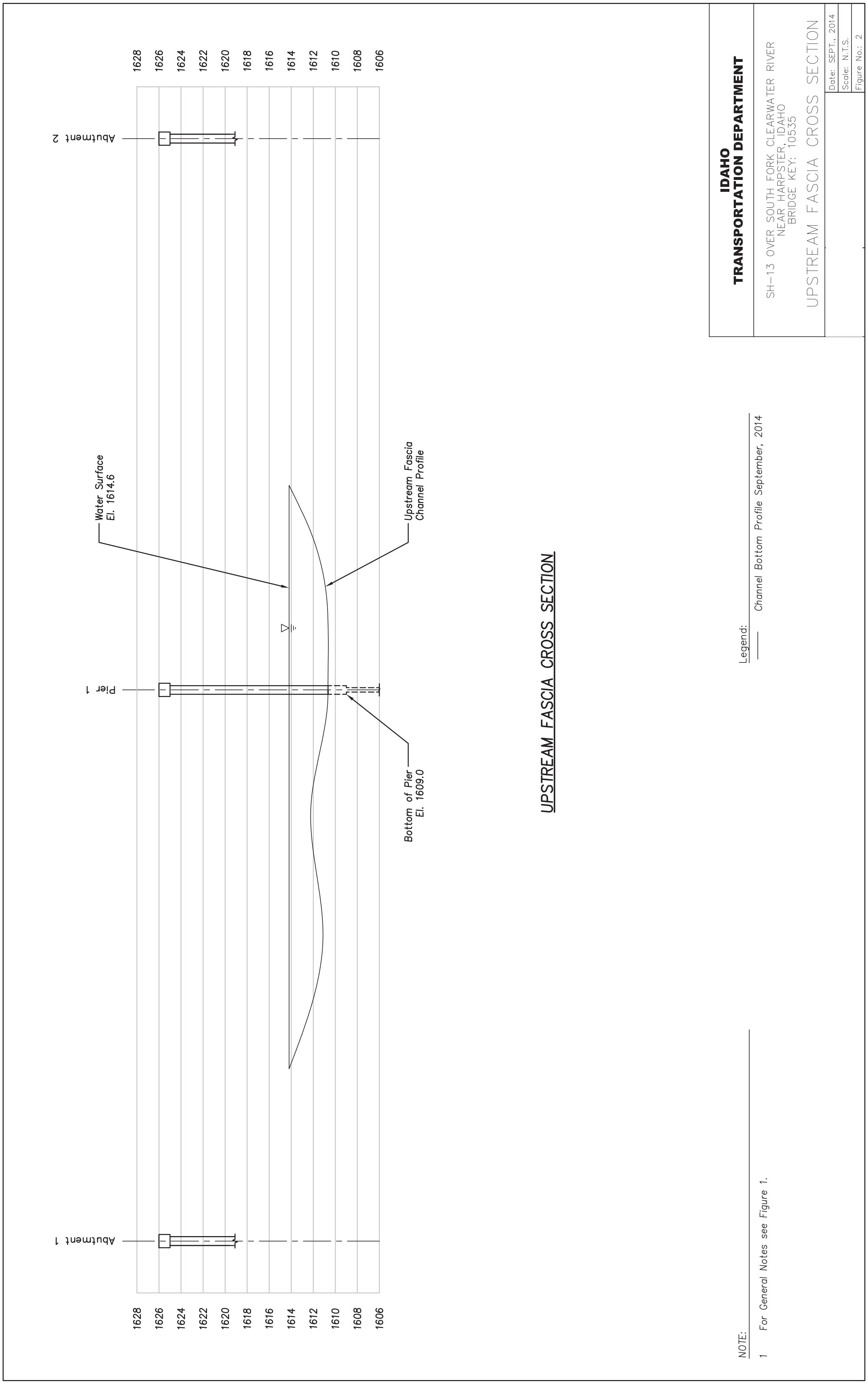
Photograph 2: View of Pier 1, Looking North.

Photograph 3: Construction Joint with Exposed Reinforcing Steel at the Downstream Nose, Looking West.

Photograph 4: Typical Condition of Concrete at Waterline

Photograph 5: Typical Condition of Concrete Underwater


Abutment 1
Abutment 2
℄ 10535
Shoreline (Typ)
N
-2.4
-1.1
-2.4
-0.6
-0.8
-0.4
-1.0
-2.4
-2.0
-0.8
-1.6
-2.6
-1.7
-2.4
1
2
3
Flow
South Fork Clearwater River
INSPECTION PLAN
INSPECTION NOTES:
1 The channel bottom material around the perimeter of Pier 1 consisted of riprap up to 3.0 feet in diameter, with no probe rod penetration.
2 Pier 1 exhibited a band of scaling from 1.0 foot below the waterline to 4.0 feet above the waterline around the entirety of the pier, with a maximum of 0.5 inch penetration and exposed aggregates.
3 Section loss at construction joint typically up to 6 inches high and exhibiting penetrations of up to 6 inches, ranging in elevation from 2 feet below the waterline to 1 foot above, extending from the midpoint of the north face of Pier 1, around the downstream nose, and up to the downstream quarter-point of the south face. Construction joint exhibited reinforcing steel with up to 25 percent loss of section.
GENERAL NOTES:
1 At the time of inspection on September 5, 2014, the waterline was located approximately 12.3 feet below the top of the pier cap at the downstream nose of Pier 1. Based on the elevation of 1626.92 feet from the design drawings, the waterline elevation was 1614.6 feet.
2 Soundings indicate the water depths at the time of inspection and are measured in feet.
3 These figures were developed from available design plans, notes and field measurements.
Legend:
-1.0 Water Depth Sounding
Timber Debris
Area of Undermining
IDAHO TRANSPORTATION DEPARTMENT
SH-13 OVER SOUTH FORK CLEARWATER RIVER
NEAR HARPSTER, IDAHO
BRIDGE KEY: 10535
INSPECTION PLAN AND NOTES
Date: SEPT., 2014
Scale: N.T.S.
Figure No.: 1


IDAHO TRANSPORTATION DEPARTMENT
SH-13 OVER SOUTH FORK CLEARWATER RIVER
NEAR HARPSTER, IDAHO
BRIDGE KEY: 10535
UPSTREAM FASCIA CROSS SECTION
Date: SEPT., 2014
Scale: N.T.S.
Figure No.: 2
1628
1626
1624
1622
1620
1618
1616
1614
1612
1610
1608
1606
Abutment 1
Pier 1
Abutment 2
Water Surface El. 1614.6
Upstream Fascia Channel Profile
Bottom of Pier El. 1609.0
UPSTREAM FASCIA CROSS SECTION
Legend:
Channel Bottom Profile September, 2014
NOTE:
1 For General Notes see Figure 1.

## Idaho Transportation Department

## Structure Inventory and Appraisal Update

| | | | |
|---|---|---|---|
| Bridge Key: | 10295 | Structure Name: | 00910A 13.28 |
| (6)Features Intersected: | PALOUSE RIVER | (9)Location: | 13.6 NW. DEARY |
| Xref Structure Name: | | Admin Jurisdiction: | 0002 District 2 |

Sufficiency Rating: 76.7

Deficiency: Not Deficient

**IDENTIFICATION**

| | |
|---|---|
| (1)State: | 16 Idaho |
| (2)District: | District 2 |
| (3)County: | 057 Latah |
| (4)Place Code: | Not within City/Town |
| (5)Inventory Route: | 131000090 |
| (7)Facility Carried: | SH 9 |
| (11)Milepoint: | 013.190 |
| (12)Base Hwy Network: | Not on Base Network |
| (13a)LRS Inventory Route: | |
| (13b)LRS Sub Route: | |
| (16)Latitude: | 46° 54' 54" |
| (17)Longitude: | 116° 44' 28" |
| (98)Border Bridge Code: | |
| (99)Border Bridge ID: | |
| Segment Code: | 001860 |
| Segment Under Rte: | |
| Segment Other Rte: | |
| Drawing Number: | 5906 |
| Project Key Number: | 935 |
| Inspection Area: | 2 |

**STRUCTURE TYPE AND MATERIALS**

(43a/b)Main Span Material/Design:
2 Concrete Continuous 4 Tee Beam

(44a/b)Approach Span Material/Design:

| | |
|---|---|
| (45)No. of Spans Main Unit: | 3 |
| (46)No. of Approach Spans: | 0 |
| (107)Deck Type: | 1 Concrete-Cast-in-Place |
| (108a)Wearing Surface: | 6 Bituminous |
| (108b)Membrane: | 0 None |
| (108c)Deck Protection: | None |

**Deck Applications**

**CLASSIFICATION**

| | |
|---|---|
| (112)NBIS Length: | Long Enough |
| (104)Highway System: | 0 Not on NHS |
| (26):Functional Class: | 07 Rural Mjr Collector |
| (100)Defense Highway: | 0 Not a STRAHNET hwy |
| (101)Parallel Structure: | No || bridge exists |
| (102)Direction of Traffic: | 2 2-way traffic |
| (103)Temporary Structure: | |
| (105)Federal Lands Highway: | 0 N/A (NBI) |
| (110)Design Natl Network: | 0 Not part of natl netwo |
| (20)Toll Facility: | 3 On free road |
| (21)Custodian: | State Highway Agency |
| (22)Owner: | State Highway Agency |
| (37)Historical Significance: | 2 Br eligible for NRHP |

**GEOMETRIC DATA**

| | |
|---|---|
| (48)Maximum Span Length: | 65.9 ft |
| (49)Structure Length: | 113 ft |
| Total Length: | 113 ft |
| (50a)Curb/Sidewalk Width Lt: | 0.0 ft |
| (50b)Curb/Sidewalk Width Rt: | 0.0 ft |
| (51)Width Curb to Curb: | 26.0 ft |
| (52)Width Out to Out: | 30.0 ft |
| (32)App Roadway Width: | 27 ft |
| (33)Median: | 0 No median |
| (34)Skew: | 0° |
| (35)Structure Flared: | 0 No flare |
| (10)Vertical Clearance: | 99.99 ft |
| (47)Total Horiz Clearance: | 26.0 ft |
| (53)Min Vert Clr Over Deck: | 99.99 ft |
| (54a)Min Vert Underclr Ref: | N Feature not hwy or RR |
| (54b)Min Vert Underclr: | 0.0 ft |
| (55a)Min Lat Underclr Ref Rt: | N Feature not hwy or RR |
| (55b)Min Lat Underclr Rt: | 0.0 ft |
| (56)Min Lat Underclr Lt: | 0.0 ft |

**Environmental**

Environmental Concerns: No

# Idaho Transportation Department

## Structure Inventory and Appraisal Update

| | | | |
|---|---|---|---|
| Bridge Key: | 10295 | Structure Name: | 00910A 13.28 |
| (6)Features Intersected: | PALOUSE RIVER | (9)Location: | 13.6 NW. DEARY |
| Xref Structure Name: | | Admin Jurisdiction: | 0002 District 2 |

**LOAD RATING**

| | |
|---|---|
| (31)Design Load: | 3 MS 13.5 (HS 15) |
| (64)Operating Rating: | 46 tons / HS25.5 |
| (66)Inventory Rating: | 28 tons / HS15.6 |
| (70)Posting: | 5 At/Above Legal Loads |
| (41)Posting Status: | A Open, no restriction |

**CONDITION**

| | |
|---|---|
| (58)Deck: | 6 Satisfactory |
| (59)Superstructure: | 5 Fair |
| (60)Substructure: | 6 Satisfactory |
| (61)Channel/Protection: | 5 Bank Prot Eroded |
| (62)Culvert: | N N/A (NBI) |

**AGE AND SERVICE**

| | | | |
|---|---|---|---|
| (27)Year Built: | 1953 | | |
| (106)Year Reconstructed: | | | |
| (42a)Type of Service On: | 1 Highway | | |
| (42b)Type of Service Under: | 5 Waterway | | |
| (28a)Lanes On: 2 | | (28b)Lanes Under: | 0 |
| (29)ADT: | 1100 | | |
| (30)Year of ADT: | 2014 | | |
| (109)Truck ADT: | 10% | | |
| (19)Detour Length: | 11 miles | | |
| Speed Limit: | 55 MPH | | |

**APPRAISAL**

| | |
|---|---|
| (67)Structure Condition: | 5 Above Min Tolerable |
| (68)Deck Geometry: | 5 Above Tolerable |
| (69)Undrclear,Vert and Horiz: | N Not applicable (NBI) |
| (71)Waterway Adequacy: | 8 Equal Desirable |
| (72)Approach Alignment: | 8 Equal Desirable Crit |
| (36)Traffic Safety Features: | |
| (a)Bridge Rail: | 1 Meets Standards |
| (b)Transition: | 1 Meets Standards |
| (c)Approach Rail: | 1 Meets Standards |
| (d)Approach Rail Ends: | 1 Meets Standards |
| (113)Scour Critical: | 8 Stable Above Footing |

**PROPOSED IMPROVEMENTS**

| | |
|---|---|
| (75a)Type of Work: | |
| (75b)Work Done By: | |
| (76)Length of Improvement: | |
| (94)Bridge Improvement Cost: | |
| (95)Rdwy Improvement Cost: | |
| (96)Total Project Cost: | |
| (97)Year of Cost Estimate: | |
| (114)Future ADT: | 1650 |
| (115)Year of Future ADT: | 2034 |
| YEAR PROGRAMMED: | |

**NAVIGATION DATA**

| | |
|---|---|
| (38)Navigation Control: | Permit Not Required |
| (39)Vertical Clearance: | |
| (40)Horizontal Clearance: | |
| (111)Pier Protection: | |
| (116)Lift Bridge Vert Clr: | |

**INSPECTION**

| | | | |
|---|---|---|---|
| (90)Inspection Date: | 7/8/2014 | (91)Inspection Frequency: | 24 months |
| (92)Supplemental Inspections Frequency: | | (93)Date of Inspections: | |
| (a)Fracture Critical Detail: | NA | (a)FC Inspection Date: | |
| (b)Underwater Inspection: | NA | (b)UW Inspection Date: | |
| (c)Fatique Detail (OS) Inspection: | NA | (c)Fatique Detail (OS) Date: | |
| (d)UBIT Inspection: | NA | (d)UBIT Date: | 4/19/2005 |
| (e)Confined Space Inspection: | NA | (e)Confined Space Date: | |
| Channel Cross Section Date: | | | |
| Equipment Needed for Regular Inspection? | None | | |

## Idaho Transportation Department

## Structure Inventory and Appraisal Update

| | | | |
|---|---|---|---|
| Bridge Key: | 10295 | Structure Name: | 00910A 13.28 |
| (6)Features Intersected: | PALOUSE RIVER | (9)Location: | 13.6 NW. DEARY |
| Xref Structure Name: | | Admin Jurisdiction: | 0002 District 2 |

**WEARING SURFACE and DEAD LOAD INFORMATION**

| | | | |
|---|---|---|---|
| **Asphalt:** | 1.0 *inches* | **Concrete:** | 0.0 *inches* |
| **Granular:** | 0.0 *inches* | **Timber:** | 0.0 *inches* |

**POSTING INFORMATION**

**WEIGHT**

Load Analysis Date: 03/18/2011

Load Analysis Required: N Analysis Complete

| | Load Rating Analysis IR (tons) | OR (tons) | | Recommended Posting(tons) | Actual Posting(tons) |
|---|---|---|---|---|---|
| **H Truck** | | | | | |
| **HS Truck** | 28 | 46 | | | |
| **Type3 (3 axle)** | 24 | 41 | **Type3 (3 axle)** | | |
| **Type 3S2 (5 axle)** | 38 | 65 | **Type 3S2 (5 axle)** | | |
| **Type 3-3 (6 axle)** | 38 | 65 | **Type 3-3 (6 axle)** | | |
| | | | **Max Axle** | | |

**HEIGHT**

| | Recommended | Actual |
|---|---|---|
| **Height Posting:** | | |

**ACTUAL WIDTH POSTING**

**Single Lane All Vehicles:** N

**Single Lane Trucks/Buses:** N

**Idaho Transportation Department**
**Structure Inventory and Appraisal Update**

Bridge Key: ____________________________ Structure Name: ___________________________________
(6)Feature Intersected: ___________________________ (9)Location: ___________________________________
Xref Structure Name: ____________________________ Admin Juris: ___________________________________

**Sufficiency Rating:** ________
**Deficiency:** _______________

**IDENTIFICATION**

(1) State: 160
(2) District: ____
(3) County: __________
(4) Place Code: ________
(5) Inventory Route: __________________
(7) Facility Carried: __________________________________
(11) Milepoint: __________
(12) Base Highway Network: ____
(13a) LRS Inventory Route: _____________________
(13b) LRS Sub Route: ___
(16) Latitude: ___________
(17) Longitude: _______________
(98) Border Bridge Code/Pct: _______
(99) Border Bridge Number: _______________________
Macs Segment On Route: ___________
Macs Segment Under Route: ____________
Macs Segment Other: ___________
Drawing Number: ________
Project Key Number: _______
Inspection Area: _______

**STRUCTURE TYPE & MATERIALS**

(43) Main Span Material/Design: ____ / ____
(44) Approach Span Material/Design: ____ / ____
(45) Number of Spans - Main Unit: _____
(46) Number of Approach Spans: _______
(107) Deck Type: ____
(108a) Wearing Surface: ____
(108b) Membrane: ____
(108c) Deck Protection: ____

**CLASSIFICATION**

(112) NBIS Bridge Length: ____
(104) Highway System: _______
(26) Functional Classification: ____
(100) Defense Highway: ____
(101) Parallel Structure: ____
(102) Direction of Traffic: ____
(103) Temporary Structure: ____
(105) Federal Lands Highway: ____
(110) Designated Natl Network: ____
(20) Toll Facility: ____
(21) Custodian: ____
(22) Owner: ____
(37) Historical Significance: ____

**GEOMETRIC DATA**

(48) Maximum Span Length: ________ ft
(49) Structure Length: ___________ ft
Total Length: ___________ ft
(50a) Curb/Sidewalk Width Lt: _______ ft
(50b) Curb/Sidewalk Width Rt: _______ ft
(51) Width Curb to Curb: ________ ft
(52) Width Out to Out: _________ ft
(32) Approach Roadway Width: _______ ft
(33) Median: ____
(34) Skew: ____
(35) Structure Flared: ____
(10) Vertical Clearance: ________ ft
(47) Total Horizontal Clearance: ________ ft
(53) Min Vertical Clr Over Deck: ________ ft
(54a) Min Vertical Underclearance Ref: ___
(54b) Min Vertical Underclearance: ________ ft
(55a) Min Lat Underclearance Ref Rt: ____
(55b) Min Lat Underclearance Rt: _______ ft
(56) Min Lat Underclearance Lt: ________ ft

**Idaho Transportation Department**
**Structure Inventory and Appraisal Update**

Bridge Key: ____________________________ Structure Name: __________________________________

(6)Feature Intersected: __________________________ (9)Location: __________________________________

Xref Structure Name: ___________________________ Admin Juris: __________________________________

**LOAD RATING**

(31) Design Load: ____

(64) Operating Rating: ____ ton

(66) Inventory Rating: ____ ton

(70) Bridge Posting: ____

(41) Structure Status: ____

**CONDITION**

(58) Deck: ____

(59) Superstructure: ____

(60) Substructure: ____

(61) Channel/Channel Protection: ____

(62) Culvert: ____

**AGE & SERVICE**

(27) Year Built: _______

(106) Year Reconstructed: _______

(42a) Type of Service On: ____

(42b) Type of Service Under: ____

(28a) Lanes On: ____ (28b) Lanes Under: ____

(29) Average Daily Traffic: ___________

(30) Year of ADT: _____

(109) Truck ADT: ____

(19) Detour Length: _____

**APPRAISAL**

(67) Structure Condition: ____

(68) Deck Geometry: ____

(69) Underclearance, Vert & Horiz: ____

(71) Waterway Adequacy: ____

(72) Approach Alignment: ____

(36) Traffic Safety Features:

a)Bridge Rail: ____

b)Transition: ____

c)Approach Rail: ____

d)Approach Rail Ends: ____

(113) Scour Critical: _____

**PROPOSED IMPROVEMENTS**

(75a) Type of Work: _____

(75b) Work Done by: _____

(76) Length of Improvement: ____________

(94) Bridge Improvement Cost: __________

(95) Roadway Improvement Cost: __________

(96) Total Project Cost: __________

(97) Year of Cost Estimate: _______

(114) Future ADT: ____________

(115) Year of Future ADT: _______

Year Programmed: ________

**NAVIGATION DATA**

(38) Navigation Control: ____

(39) Vertical Clearance: ________ ft

(40) Horizontal Clearance: __________ ft

(111) Pier Protection: ____

(116) Lift Bridge Vert Clr: __________ ft

**INSPECTIONS**

(90) Inspection Date: _______________

(92) Supplemental Inspections Frequency:

a)Fracture Critical Detail: ____ months

b)Underwater Inspection: ____ months

c)Fatigue Detail (OS) Inspection: ____ months

d)ReachAll Inspection: ____ months

e)Confined Space Inspection: ____ months

(91) Inspection Frequency: ____ months

(93) Date of Supplemental Inspections:

a)FC Inspection Date: ____________

b)UW Inspection Date: ______________

c)Fatigue Detail (OS) Date: ____________

d)ReachAll Date: ______________

e)Confined Space Date: ____________

Special Equipment Needed: ____

**Idaho Transportation Department**
**Structure Inventory and Appraisal Update**

| | |
|---|---|
| Bridge Key: ____________________________ | Structure Name: __________________________________ |
| (6)Feature Intersected: __________________________ | (9)Location: __________________________________ |
| Xref Structure Name: ___________________________ | Admin Juris: __________________________________ |

**Wearing Surface & Dead Load Information**

Asphalt: _____inches        Concrete: _____inches
Granular: _____inches        Timber: _____inches

**POSTING INFORMATION**
WEIGHT

Bars Load Analysis Date: ________________

Bars Analysis Required: ____

| | Load Rating Analysis IR (tons) | OR(tons) | | Recommended Posting(tons) | Actual Posting(tons) |
|---|---|---|---|---|---|
| H Truck | ____ | ____ | | | |
| HS Truck | ____ | ____ | | | |
| Type3 (3 axle) | ____ | ____ | Type3 (3 axle) | ____ | ____ |
| Type3S2 (5 axle) | ____ | ____ | Type3S2 (5 axle) | ____ | ____ |
| Type3-3(6 axle) | ____ | ____ | Type3-3 (6 axle) | ____ | ____ |
| | | | Max Axle | ____ | ____ |

**HEIGHT**

| | Recommended | Actual |
|---|---|---|
| Height Posting: | _________ ft | _________ ft |

**WIDTH**

| | Actual |
|---|---|
| Single Lane All Vehicles: | ____ |
| Single Lane Trucks/Bus: | ____ |

*************************************************************************************************************

**UNDER RECORD INFORMATION (if applicable)**

(5) Inventory Route: ______________________

(7) Facility Under Structure: ______________________________________

(10) Minimum Vertical Clearance: ____________ ft

(47) Inventory Route Total Horiz Clr: _________ ft

(11) Milepoint: _______________

(20) Toll: ____

(26) Functional Classification: ____

(29) ADT: _________

(30) Year ADT: _______

(109) Truck ADT: ____

(100) Defense Highway Designation: ____

(102) Traffic Direction: ____

(104) Highway System: ____

(110) Designated National Network: ____

**Idaho Transportation Department**
**Pontis Field Inspection Report**

Bridge Key: ____________________________ Structure Name: ___________________________________
Feature Intersected: __________________________ Location: ___________________________________
Admin Jurisdiction: ___________________________________
Xref Structure Name: _________________________ District: ___________________________________

| Element Description | Env. | Total Qty | Units | %State1 | %State2 | %State3 | %State4 | %State5 |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |

Notes:
______________________________________________________________________
______________________________________________________________________
______________________________________________________________________
______________________________________________________________________
______________________________________________________________________
__________________________________________________________

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |

______________________________________________________________________
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__________________________________________________________

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |

______________________________________________________________________
______________________________________________________________________
______________________________________________________________________
______________________________________________________________________
______________________________________________________________________
__________________________________________________________

**Idaho Transportation Department**
**Pontis Field Inspection Report**

| | |
|---|---|
| Bridge Key: ___________________________ | Structure Name: _________________________________ |
| Feature Intersected: _________________________ | Location: _________________________________ |
| | Admin Jurisdiction: _________________________________ |
| Xref Structure Name: ________________________ | District: _________________________________ |

Additional Condition Information

ROADWAY APPROACHES:

CURBS/SIDEWALKS:

EMBANKMENT:

CHANNEL:

SIGNS:

GUARDRAIL:

UTILITIES:

NOTES:

WORK ACCOMPLISHED:

***MTCE RECOMMENDATIONS***
**(Maintenance Item, Element, Priority, Work Assignment, Notes)**

Inspector:_____________________________________________________ Date:_____________

**IDAHO TRANSPORTATION DEPARTMENT**
**INSPECTION FORM**
**DISTRICT NO.**

**BRIDGE KEY:**
**STRUCTURE NO:**
**FEATURES INTERSECTED:**
**LOCATION:**

**TYPE OF INSPECTION**
- ☐ **DAMAGE**
- ☐ **REACHALL**
- ☐ **IN DEPTH**
- ☐ **SUPPLEMENTAL INSPECTION**

**DECK:**

**SUPERSTRUCTURE:**

**BEARINGS:**

**SUBSTRUCTURE:**

**EXPANSION JOINTS:**

**NOTES TO BIE:**

**MISCELLANEOUS ITEMS:**

**WORK ACCOMPLISHED:**

**MTCE RECOMMENDATIONS:**

INSPECTOR'S SIGNATURE: DATE:

# IDAHO TRANSPORTATION DEPARTMENT
# BRIDGE ASSET MANAGEMENT

## LOCAL AGENCY COMMUNICATION VERIFICATION

**BRIDGE INFORMATION**
Bridge Key:
District:
Features:
Inspector:

**BRIDGE OWNER/REPRESENTATIVE INFORMATION**
Name:
Title:
Agency:
Contact Information:

**CRITICAL FINDINGS NOTIFICATION**

☐ Critical Finding (describe):

Priority:
Notification of corrective action must be sent to the Database Manager (Patty.Fish@itd.idaho.gov) within:

☐ 2 days ☐ 10 days ☐ 30 days
☐ Other (describe)

**BRIDGE CONDITION DISCUSSION**

Comments:

☐ Discussed future projects in area with owner representative

All questions regarding the aforementioned program by the local agency were answered and all noteworthy bridge inventory changes were identified. Local Agency shall retain a copy for their records.

Signed________________________________ Inspector Date

Signed________________________________ Local Agency Date

**IDAHO TRANSPORTATION DEPARTMENT**
**BRIDGE ASSET MANAGEMENT**

**CRITICAL FINDING COMMUNICATION**

**BRIDGE INFORMATION**

Bridge Key:
District:
Features:
Inspector:

**DISTRICT REPRESENTATIVE INFORMATION**

Name:
Title:

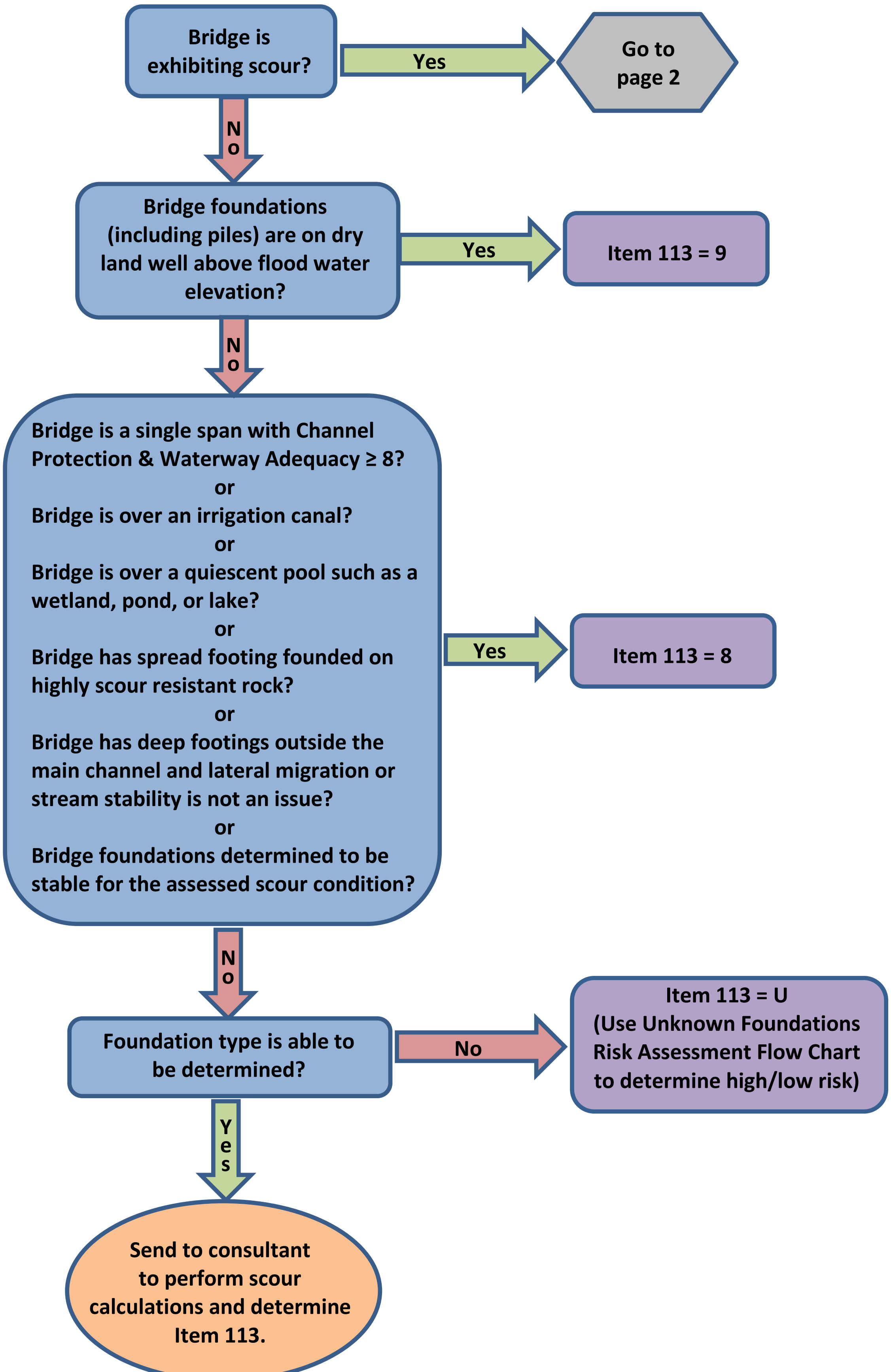
**CRITICAL FINDINGS NOTIFICATION**

☐ Critical Finding (describe):

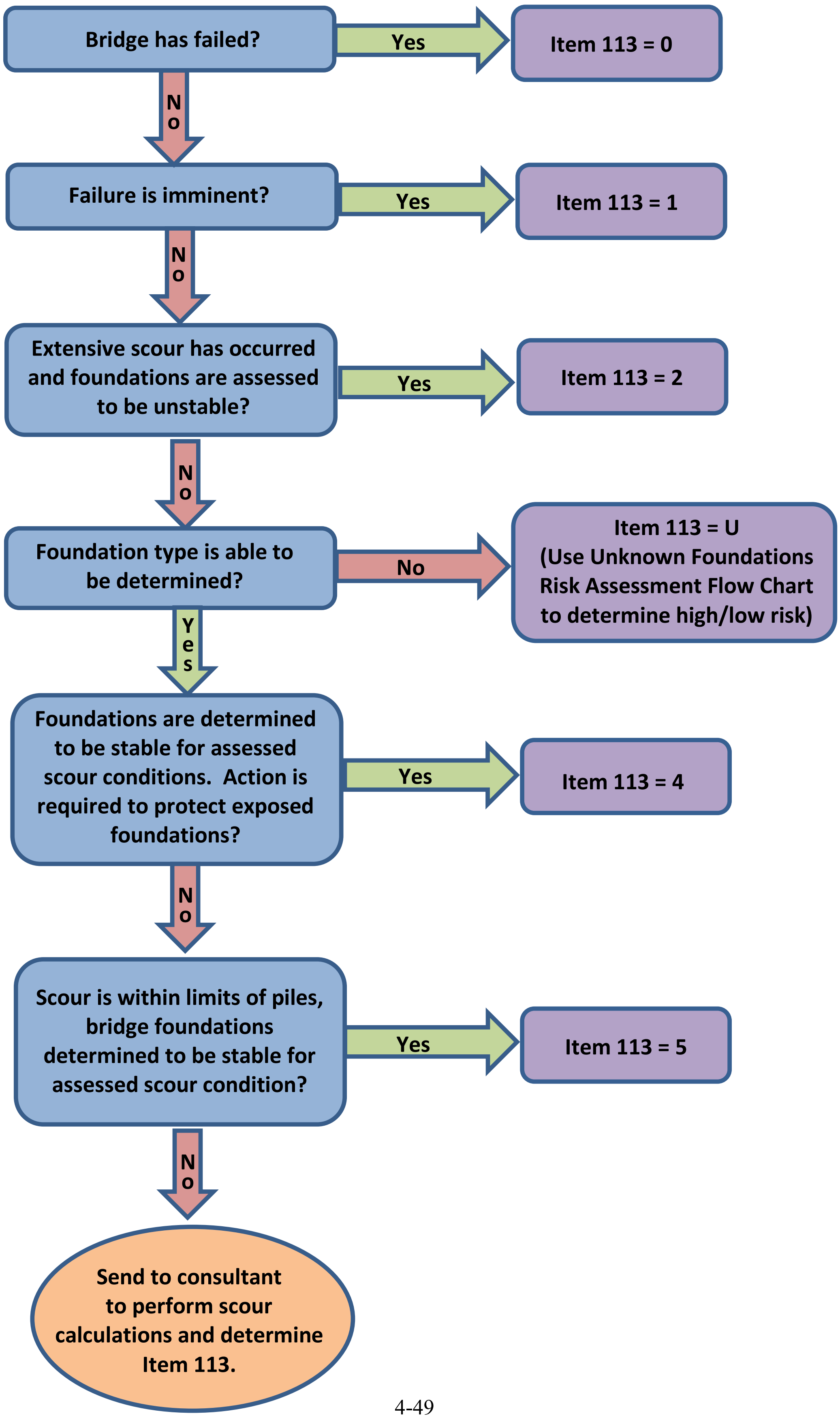
Priority:
Notification of corrective action must be sent to the Database Manager (Patty.Fish@itd.idaho.gov) within:

☐ 2 days ☐ 10 days ☐ 30 days
☐ Other (describe)

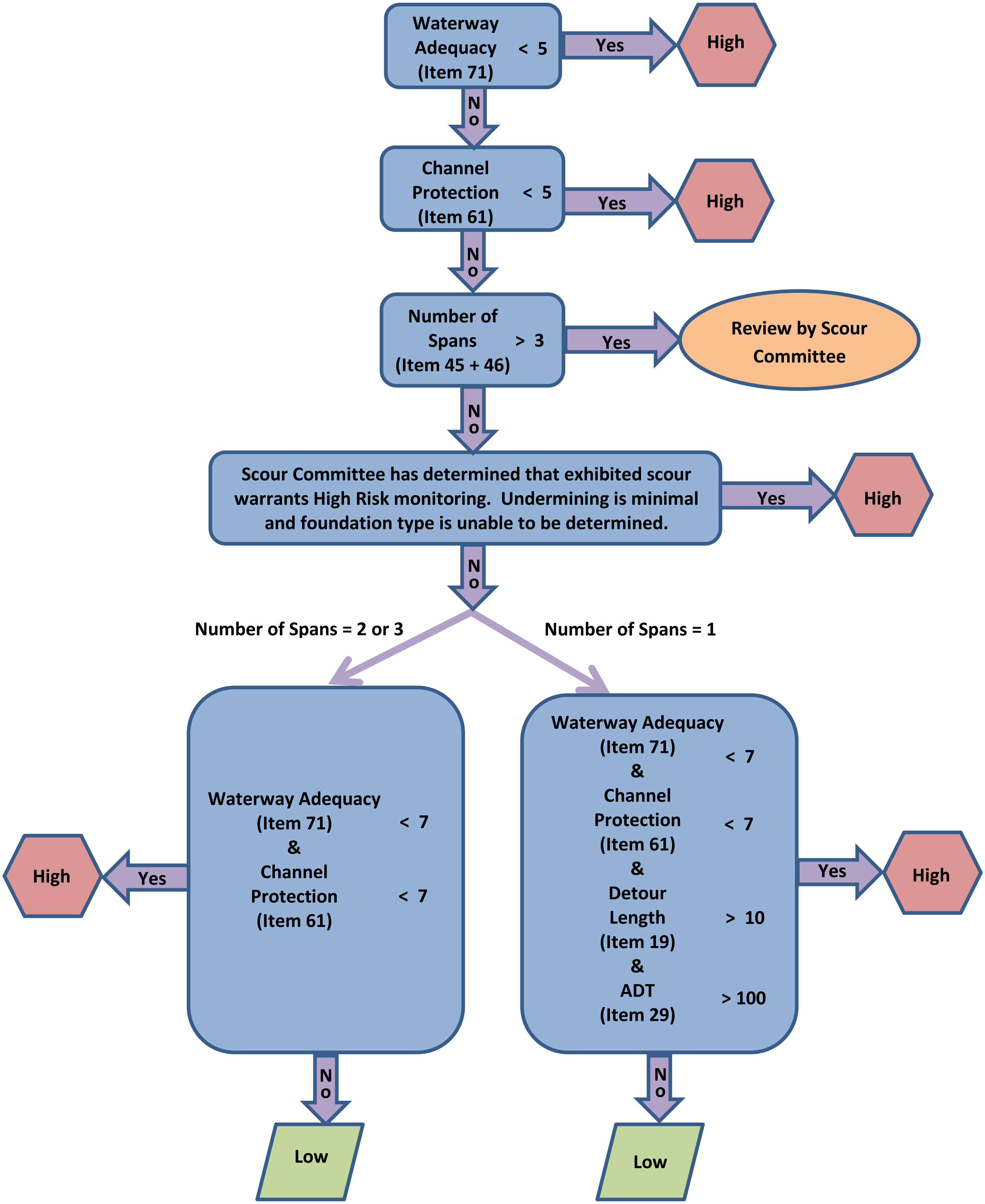
**SCOUR COMMITTEE ASSESSMENT FLOW CHART**
**BRIDGES REQUIRING A SCOUR EVALUATION (ITEM 113 = 6)**



## SCOUR COMMITTEE ASSESSMENT FLOW CHART (CONTINUED)
## BRIDGES EXHIBITING SCOUR



# UNKNOWN FOUNDATIONS BRIDGES
# RISK ASSESSMENT FLOW CHART



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## 6.0—LOAD RATING PROCEDURES

The procedures and requirements in *Section 6: Load Rating* shall be adhered to by anyone conducting load ratings for the Idaho Transportation Department.

Refer to the *Idaho Transportation Department Bridge Design LRFD Manual (BDM) Article 0.3 and Article 0.4* for submittal procedures on load rating of new/replacement bridges and bridge rehabilitation projects.

Questions about this section or Idaho Transportation Department (ITD) load rating issues shall be directed to the ITD Load Rating Engineer.

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ITD Load Rating Engineer
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### 6.0.1—Abbreviations

*ASD – Allowable Stress Design*

*ASR – Allowable Stress Rating*

*BAM – ITD Bridge Asset Management Section*

*BDM – ITD Bridge Design LRFD Manual: The ITD LRFD Bridge design policies which can be found at the following link: http://www.itd.idaho.gov/bridge/manual/manualcover.htm*

*BrM™ – AASHTOWare Bridge Management™ software (formerly known as Pontis™): Database used by ITD to store bridge inspection and load rating data*

*BrR™ – AASHTOWare Bridge Rating™ software (formerly known as Virtis™): ITD preferred load rating software*

*DC – Dead load of structural components and nonstructural attachments*

*DW – Dead load of wearing surfaces and utilities*

*FHWA – Federal Highway Administration*

*IR – Inventory Rating*

*ITD – Idaho Transportation Department*

*LFD – Load Factor Design*

*LFR – Load Factor Rating*

*LHTAC – Local Highway Technical Assistance Council*

*LRFD – Load and Resistance Factor Design*

*LRFR – Load and Resistance Factor Rating*

*LRS – Load Rating Summary: Form used by ITD to report load rating results*

*MBE – AASHTO Manual for Bridge Evaluation*

*MUTCD – Manual on Uniform Traffic Control Devices*

*NBI – National Bridge Inventory*

*NDS – National Design Specification for Wood Construction*

*NRL – Notional Rating Load*

*OR – Operating Rating*

*PS&E – Plans, Specifications, and Estimate*

*QA – Quality Assurance*

*QC – Quality Control*

*RCB – Reinforced Concrete Box*

*RCF – Reinforced Concrete Frame*

*SHV – Single Unit Specialized Hauling Vehicles (SU4, SU5, SU6, and SU7)*

*SI&A – Structural Inventory and Appraisal*

### 6.0.2—General Load Rating Criteria

The load rating of new bridges or existing bridges with modifications shall be completed within 90 days after the notification of completion of the work for State or Federal agency bridges and within 180 days after the notification of completion of the work for all other bridges.

Bridges requiring a load rating that are added to the ITD inventory due to a jurisdictional change shall be completed within 90 days after the inventory inspection for State or Federal agency bridges and within 180 days of the inventory inspection for all other bridges.

All load ratings shall be in accordance with the *MBE* version currently used by ITD as supplemented by this manual.

### 6.0.3—Load Rating Software and Analysis Engine

Load ratings shall be done with the most current version of *BrR*™ as licensed by ITD. Reinforced concrete, prestressed concrete and steel bridges shall be analyzed in *BrR*™ utilizing the AASHTO engine, unless otherwise approved by ITD. All timber bridges shall be analyzed in *BrR*™ utilizing the Madero engine. If the structure cannot be load rated with *BrR*™, the ITD Load Rating Engineer shall be contacted for guidance on what load rating program should be used.

The *BrR*™ software is an *AASHTOWare* product and can be obtained by contacting AASHTO. The order form can be found at:

http://www.aashtoware.org

The *BrR*™ Special Consultant License can be purchased to do work for ITD. Please follow the steps below to obtain a *BrR*™ Special Consultant License.

1. Fill out the form at the link shown above and e-mail it to the AASHTO e-mail address listed on the form.

2. Send a copy of the e-mail to the ITD Load Rating Engineer: shanon.murgoitio@itd.idaho.gov

There are several Appendices regarding the use of the *BrR*™ software they can be found as follows:

*Appendix 6.3.1—VIRTIS™ SETUP TUTORIAL*
*Appendix 6.3.2—CREATING A NEW BRIDGE IN VIRTIS™*
*Appendix 6.3.3—ENTERING DESCRIPTION DATA IN VIRTIS™*

*Appendix 6.3.4—VIRTIS™ IMPORT EXPORT DELETE TUTORIAL*
*Appendix 6.3.5—MODIFICATIONS TO STANDARD VIRTIS™ SETTINGS*
*Appendix 6.3.6—ANALYZE AND VIEW VIRTIS™ RESULTS TUTORIAL*
*Appendix 6.3.7—USING NON-STANDARD GAUGES WITH VIRTIS™*

*Appendices 6.3.1-6.3.7* were created in Virtis™ version 6.3 or earlier which is no longer the current version. Some screenshots and instructions may vary. Any inconsistencies that may affect the load rating shall be brought to the attention of the Load Rating Engineer prior to completing the load rating.

## 6.0.4—Required Deliverables

### 6.0.4.1—New/Replacement Bridge Projects, or Existing Bridges without a *BrR*™ File

Refer to the *BDM Article 0.3* and *Article 0.4* for submittal procedures on load rating of new/replacement bridges. Load rating submittals for new/replacement bridges, or existing bridges which do not have an existing *BrR*™ file, shall require the following deliverables:

1. *BrR*™ file (no hard copy; XML electronic file only)

2. Stamped and signed Load Rating Summary (LRS) form (hard copy and PDF format). An electronic copy of the LRS can be obtained by contacting the ITD Load Rating Engineer or downloaded using the following links (LFR, LRFR). Example forms and directions on filling them out can be found in the following appendices:

   *Appendix 6.1.1—EXAMPLE LRFR LOAD RATING SUMMARY FORM*
   *Appendix 6.1.2—LRFR LOAD RATING SUMMARY DIRECTIONS*
   *Appendix 6.1.3—EXAMPLE LFR LOAD RATING SUMMARY FORM*
   *Appendix 6.1.4—LFR LOAD RATING SUMMARY DIRECTIONS*

3. Supporting calculations. If the rating is done in *BrR*™, supporting calculations shall be included in the Member Description as shown in *Appendix 6.3.3*. If the supporting calculations are too cumbersome to put in the Member Description, they may be submitted as a separate document in PDF format. Examples of this are LRFD live load distribution factors. Calculations for live load distribution factors do not need to be shown if they are automatically calculated by *BrR*™ from the bridge typical section.

4. Independent calculations for design truck inventory rating factors less than 0.90 or greater than 1.50 shall be submitted per *Article 6.0.6*.

5. For new/replacement bridges, the PS&E plans (11x17 hard copy or PDF format), and the approved shop drawings (PDF format).

### 6.0.4.2—Rehabilitated Bridges

All bridge rehabilitation projects shall have their load rating reviewed and updated as necessary. The load rating file should be updated to reflect the rehabilitation project changes, such as changes in wearing surface depth and/or unit weight, and rail retrofits.

Refer to the *BDM Article 0.3 and Article 0.4* for submittal procedures on load rating of bridge rehabilitation projects. For bridge rehabilitation projects designed by ITD staff, refer to the checklist in *Appendix 6.4.1* for the required steps for updating the *BrR*™ file. Load rating submittals for rehabilitated bridges shall require the following deliverables:

1. Updated *BrR*™ file (no hard copy; XML electronic file only).

2. Stamped and signed Load Rating Summary (LRS) form (hard copy and PDF format). An electronic copy of the LRS can be obtained by contacting the ITD Load Rating Engineer or downloaded using the following links (LFR, LRFR). Examples of ITD LRS forms and directions on how to fill them out can be found in *Appendices 6.1.1-6.1.4*. The LRS is not required to be stamped by the bridge rehabilitation project designer.

3. Any supporting calculations (PDF format).

4. Independent calculations for design truck inventory rating factors less than 0.90 or greater than 1.50 **do not** need to be submitted.

5. The bridge rehabilitation project plans (11x17 hard copy or PDF format).

### 6.0.5—Rating Results and Rating Units

All rating results shall be reported in English units on the LRS form. *BrR*™ allows the rater to toggle between Metric and English units in the load rating summary output.

The live load models for load rating shall be evaluated under the rating criteria listed in *Tables 6A.2.3.1-1, 6A.2.3.1-2, and 6B.6.2-1* and summarized in the appropriate Load Rating Summary form, found in *Appendices 6.1.1-6.1.4*.

Bridge plans in English units shall be input into the rating software using English units and the rating results shall be reported in English Tons. Bridge plans in Metric units may be input into the rating software using Metric or English units, but the rating results shall be reported in English Tons.

### 6.0.6—Quality Assurance and Quality Control

All load ratings by consultants that do not have a *BrR*™ file must have a load rater, a checker, and a QC engineer. Either the load rater or the checker must be a registered Professional Engineer licensed in the state of Idaho.

All new load ratings by ITD staff (Bridge Design or Bridge Asset Management) that do not have a *BrR*™ file require a load rater and a checker, at least one of which must be a registered Professional Engineer licensed in the state of Idaho. The QC of the load rating shall be performed by the ITD Bridge Asset Management staff.

All load ratings that are required due to the rehabilitation of a structure done by ITD staff (Bridge Design or Bridge Asset Management) require a load rater and a checker, at least one of which must be a registered Professional Engineer licensed in the state of Idaho. The exception to this is if the rehabilitation is limited to the deck. In this case, only a load rater and QC person are required. The QC of the load rating shall be performed by the ITD Bridge Asset Management staff. A checklist for ITD rehabilitation load ratings that have an existing *BrR*™ file can be found in *Appendix 6.4.1.*

For bridge load ratings that are based on design plans and/or shop drawings; if the inventory rating factor for the design vehicle is less than 0.90 or greater than 1.50, independent calculations for the design truck must be submitted with the load rating package for the controlling location on the controlling member for the controlling limit state.

- The independent calculations shall be performed for the dead loads, design truck live load, and capacities by hand calculations or by load rating software other than *BrR*™.

- No portion of the independent calculations shall be taken from the *BrR*™ output. A short description of the reason the structure rates low or high must also be included with the rating package (ex: code has changed significantly since the time this structure was built, this structure was designed for future loads that are not currently on the bridge, etc.)

For bridge load ratings that are based on bridge measurements from field sketches, independent calculations do not need to be performed for any rating factor.

### 6.0.7—Rating Model

Bridges modeled in *BrR*™ shall use a girder system definition when possible. Single line girder analysis shall not be conducted unless approved in advance by the ITD Load Rating Engineer.

All primary superstructure members shall be load rated. For girder type bridges, load rating shall be performed for the girders and stringer/floor beam systems, if applicable. Load rating of cross-beams, diaphragms, and cross-frames shall not be performed.

Concrete bridge decks need not routinely be evaluated, but timber and corrugated metal decks shall be evaluated per *Article 6.1.5.1.* Substructures need not routinely be evaluated per *Article 6.1.5.2.*

Model each simple span as a separate, single span superstructure. Model a continuous span as a multi-span superstructure. Restraint moments for continuous girders shall not be considered, except for cantilevered spans. Only one superstructure model is necessary for spans that are identical.

*Example 1: Simple 2 span bridge. Both spans are identical (span length, typical section, applied loads, etc.). Only one superstructure model is necessary.*

*Example 2: Simple 3 span bridge. Spans 1 & 3 are identical, but Span 2 is longer. One superstructure model representing Spans 1 & 3 and one superstructure model representing Span 2 are necessary.*

Simple span bridges modeled in *BrR*™ shall not have the deck reinforcement input into the model.

Varied Girder Spacing for LFR – In the case where girder spacing varies, the live load distribution factor shall be calculated using the spacing at the maximum third point along the span.

For bridges with a composite concrete deck, the structural deck thickness shall be reduced by 0.50 inch to account for a sacrificial wearing surface if both of the following are true:

1. If the design plans do not show at least a 1.0-inch asphalt wearing surface applied at the time of bridge construction.

2. There is not at least 1.0 inch of asphalt wearing surface on the bridge per the most recent bridge inspection report.

The 0.50-inch sacrificial concrete wearing surface shall NOT be reported on the LRS form under the "Existing Wearing Surface Type & Depth" box. For bridges which have had a concrete overlay applied to the deck, the deck structural thickness shall be considered as the combined thickness of the original deck and the concrete overlay minus the 0.50-inch sacrificial wearing surface.

In *BrR*™ files, the general description data and notes in the file shall be in accordance with *Appendix 6.3.3*.

### 6.0.7.1—Prestressed Girders

The actual strand pattern shown on the shop drawings shall be used in the rating model. If the shop drawings are not available, strand locations from the design drawings shall be used. If the strand locations are not available, the center of gravity of the prestressing steel shall be used.

Prestress losses shall be as shown on the plans and input into the rating model as lump sum losses. If losses are not shown on the plans, the final working force and number of strands shall be used to calculate the prestress losses. However, if losses less than 35 ksi are shown on the plans or calculated based on final working force, 35 ksi losses shall be used. Losses less than 35 ksi may be used if the structure was designed using LRFD and loss calculations accompany the rating. If losses and final working force and/or number of strands are not shown on the plans, 45 ksi losses shall be used.

**<u>LFR</u>**

For prestressed girder inventory ratings, concrete tension at the Service III limit state shall be limited to $3\sqrt{f'c}$ (psi). For prestressed girder operating ratings, the Service III limit state shall not be checked. Shear ratings shall be performed at a distance h/2 from the face of the support and at tenth points in accordance with *Article 9.20.1.4* of the *Standard Specifications for Highway Bridges*. Distances can be specified by utilizing points of interest in *BrR*™.

**<u>LRFR</u>**

For legal ratings, concrete tension at the Service III limit state shall be limited in accordance with *Table 5.9.4.2.2-1* of the *AASHTO LRFD Bridge Design Specifications*. For permit ratings, the Service III limit state shall not be checked. Shear ratings shall be performed at a distance $d_v$ from the face of the support and at tenth points in accordance with *Article 5.8.3.2* of the *AASHTO LRFD Bridge Design Specifications*. Distances can be specified by utilizing points of interest in *BrR*™.

### 6.0.7.2—Steel Girders

Steel I-girders that satisfy the criteria in *Article 4.6.1.2.4b* of the *AASHTO LRFD Bridge Design Specifications* may be analyzed as straight girders.

For steel girder ratings on structures with field measurements only (no plans):

- If the inspection report specifically notes that the girders are rolled shapes, use the field dimensions to pick the closest rolled shape in the historic list of AISC shapes.

- If the inspection report does not indicate that the girders are rolled shapes, input the girders as a built up member using the actual dimensions on the field sketch.

  For all steel:

- Plastic analysis is allowed if permitted by the *Article 6.12.2* of the *AASHTO Bridge Design Specifications* (for LRFD) and *Articles 10.48.1, 10.53.1.1and 10.54.2.1 of the AASHTO Standard Specifications* (for LFR).
- Bearing stiffeners shall be considered in the rating.
- For LFR, steel serviceability (overload) shall be checked for both inventory and operating ratings.
- Stiffener and splice plate dead loads shall be input into the *BrR*™ model as concentrated Member Loads.

### 6.0.7.3—Reinforced Concrete Girders

Shear ratings shall be performed at a distance d from the face of the support and at tenth points in accordance with *Article 8.16.6.1.2* of the *AASHTO Standard Specifications for Highway Bridges (Article 5.8.3.2* of the *AASHTO LRFD Bridge Design Specifications).* Distances can be specified by utilizing points of interest in *BrR*™. Schedule based input shall be used for reinforced concrete girders.

Support conditions shall be set to “free” at bridge ends and “frame" at piers for both LFR and LRFR ratings of reinforced concrete bridges with cantilevered end spans. The effective width of the concrete deck slab in tension shall be taken as the tributary width perpendicular to the axis of the member for determining flexural resistance in accordance with *Article 4.6.2.6.1* of the *AASHTO LRFD Bridge Design Specifications*.

### 6.0.7.4—Reinforced Concrete Frames and Box Structures

**<u>Analysis</u>**

Reinforced concrete frame (RCF) and box (RCB) structures shall be input into *BrR*™ as Culvert Definitions when possible. For situations where the Culvert Definition is not possible, a line girder definition shall be used.

For Culvert Definitions:

- For both LFR and LRFR, structures shall be fixed against lateral movement at the base and free to side-sway at the top in accordance with *BDM Article 12.11*.
- RCF structures shall have moments released at the bottom of the walls. RCB structures shall NOT have moments released at the bottom of the walls.
- If the bottom slab of an RCB structure controls and has a low rating, a *k*-value (subgrade modulus also called the Modulus of Subgrade Reaction) may be entered for the subgrade soil. A k-value of 150 pci is recommended unless additional information is provided on the design plans or by the Load Rating Engineer.
- Shear in the top slab shall be ignored in the analysis.
- At-grade top slabs shall <u>not</u> have a 0.50-inch sacrificial wearing surface deducted from their thickness.
- If all the following conditions exist, the inside face of wall rating shall be ignored in the analysis:

  1. The inventory rating for the design vehicle is less than 1.0 and is controlled by the rating of the inside face of the wall.
  2. The structure has an NBI condition rating of 5 or greater for the substructure (Item 60).
  3. The structure has been in place for 20 years or more.

Ignoring the inside face of wall can be accomplished by inputting points of interest along the structure and setting the control options to only evaluate at points of interest. Tenth points in the slab shall be input from the front faces of the walls so they match the tenth point locations generated by the AASHTO engine.

For Line Girder Definitions:

- Cross section based *BrR*™ input shall be used.
- Soil pressure shall be incorporated, but live load surcharge neglected.
- Where monolithic haunches inclined at 45 degrees are used, the negative moment shall be evaluated at the intersection of the haunch and the uniform depth member per the *BDM, Article 12.11*, for both LFR and LRFR.
- The structure width shall be input as one foot.
- Shear shall be ignored in the analysis.
- At-grade top slabs shall not have a 0.50-inch sacrificial wearing surface deducted from their thickness.
- For LRFR models, impact values shall be based on the depth of fill being used in the *BrR*™ member, not the minimum depth of fill on the structure.

**Loads**

For RCF and RCB structures, the inspection reports only show the fill and wearing surface depths for one location. The inspection report does not necessarily match the plans, and often does not cover the controlling case. When the minimum and maximum fill depths vary by more than approximately one foot, both cases shall be analyzed in *BrR*™. The fill depth shall be based on the more conservative case of the approximate depth calculated from the plans or the value listed in the inspection report. The certainty of the actual condition versus what is shown on the plans is low; therefore, the accuracy of the fill depth calculations over the culverts does not need to be more accurate than ± 6”.

At-rest soil pressures shall be used in the analysis per *MBE Article 6A.5.12.10.2b*, and applied to both sides of the structure. If the at-rest soil properties are listed in the LRFD design notes on the plans, they should be used in the analysis. However, care shall be taken when inputting them to ensure they are applied properly in the model. For all other ratings, the default soil properties shown in *Table 6.0.7.4-1* shall be used.

**Table 6.0.7.4-1 Default Soil Properties for Load Rating**

| | |
|---|---|
| soil unit load $\delta^a$ | weighted average of the soil unit load used for the verticle earth load in pcf |
| saturated soil unit load $\delta_{sat}$ | same value as δ (assume free draining material) |
| at-rest lateral earth pressure coefficient (LRFD) $k_o$ | 55pcf / δ |
| active lateral earth pressure coefficient (LRFD) $k_a$ | leave input blank |
| passive lateral earth pressure coefficient (LRFD) $k_p$ | leave input blank |
| maximum lateral soil pressure (LFD) - RCF (stifflegs) | 71.5 pcf |
| minimum lateral soil pressure (LFD) - RCF (stifflegs) | 27.5 pcf |
| max. and min. lateral soil pressure (LFD) - RCB (box culverts) | 55.0 pcf |

[a] May use $\delta$ as shown on the plans if it is available. If not, use default $\delta$ values as shown in *Table 6A.2.2.1-1*.

**LRFR Ratings:**

ITD’s geotechnical engineer recommends using a default $\delta$ value of 125 pcf and a $k_o$ value of 0.44 to calculate the lateral earth loads for flat top backfill with no hydrostatic pressure. However, *BrR*™ does not have a way to input different $\delta$ values for vertical and horizontal earth loads. Therefore, the $k_o$ value input under the soil properties tab shall be adjusted so when it is multiplied by the $\delta$ value input for the vertical earth loads it gives the proper lateral earth pressure (55 pcf).

**LFR Ratings:**

Lateral Earth Pressure (EH)

The maximum and minimum lateral soil pressure for LFR listed in *Table 6.0.7.4-1* is based on

$p = \beta_E k_o \delta$.

$\beta_E$ values per *Article 3.22* of the *AASHTO Standard Specification of Highway Bridges*.

$\beta_E$ = 1.3 for lateral earth pressure for RCF structures

$\beta_E$ = 0.5 for lateral earth pressure when checking the positive moment in the top slab of RCF structures (This is also consistent with *MBE Article C6A.5.12.10.2b*).

$\beta_E$ = 1.0 for lateral earth pressure for rigid culverts (RCB)

p = lateral soil pressure

$k_o$ = 0.44 for flat top backfill with no hydrostatic pressure per recommendation from the ITD geotechnical engineer

$\delta$ = 125 pcf per recommendation from the ITD geotechnical engineer

Maximum lateral soil pressure for RCF = 1.3 (0.44) (125 pcf) = 71.5 pcf

Minimum lateral soil pressure for RCF = 0.5 (0.44) (125 pcf) = 27.5 pcf

Max. and min. lateral soil pressure for RCB = 1.0 (0.44) (125 pcf) = 55 pcf

The $\beta_E$ value used in *BrR*™ is 1.0. Since ITD uses different $\beta_E$ values, they must be applied to the soil pressure input under the soil properties tab.

In *BrR*™ v6.4.1, the minimum lateral soil pressure field does not get passed to the AASHTO culvert engine and is not used. To check the top slab of RCF structures for positive moment with $\beta_E$ =0.5 and the rest of the structure with $\beta_E$ =1.3, two separate culvert definitions that are exact copies of each other with different soils are required. The soil for the negative moment model should be input with maximum and minimum soil pressures both equal to 71.5 pcf. The soil for the positive moment model should be input with maximum and minimum soil pressures both equal to 27.5 pcf.

Live load surcharge shall be included when calculating negative moments at the corners and shall be neglected when calculating positive moments. For live load surcharge equivalent soil depths, see *Article 3.20.3* of the *AASHTO Standard Specification of Highway Bridges* for LFR and *Table 3.11.6.4-1* of the *AASHTO LRFD Bridge Design Specifications* for LRFR. However, an adjusted live load surcharge depth shall be used for LFR when using *BrR*™ to ensure the correct load is being applied in the model. The β for live load should be used for live load surcharge. *BrR*™ does apply the correct β factor to the live load surcharge load (1.67). However, the lateral earth pressure value being used has already been multiplied by $\beta_E$ per the procedure described above. Therefore, the equivalent height of soil input into *BrR*™ for live load surcharge for LFR ratings shall have to be reduced by $\beta_E$ to get the correct load. The water load on interior walls shall be neglected per *MBE Article 6A.5.12.2*.

**Table 6.0.7.4-2 Live Load Surcharge Height for *BrR*™ Input ($h_{eq}$)**

| | H[a] | LFR | LRFR |
|---|---|---|---|
| Positive Moment Model | any H value | 0' | 0' |
| Negative Moment Model | <5' | 2 '/ $\beta_E$ | 4.0' |
| | 5'-10' | | 4.0' - 0.2 (H - 5') |
| | 10'-20' | | 3.0' - 0.1 (H-10') |
| | >20' | | 2.0' |

[a] H is the distance between the surface of the road and the bottom of footing at the minimum fill rating location.

### 6.0.7.5—Corrugated Metal Decks and Concrete Filled Grid Decks

The corrugated metal deck shall be assumed to provide full lateral support for steel beams (due to the typical practice of welding the corrugations to the top flange of the steel beam during installation) unless the condition of the deck or other notes in the inspection report indicates that the welds have failed.

The distribution of wheel loads in the evaluation of corrugated metal decks shall be in accordance with *Article 9.8.5.2* of the *AASHTO LRFD Bridge Design Specifications* for both LFR and LRFR.

Live load distribution factors for LFR ratings of steel girders with concrete filled steel grid decks shall be in accordance with the live load distribution factors for steel girders with concrete decks in *Table 3.23.1* of the *AASHTO Standard Specifications for Highway Bridges.*

### 6.0.7.6—Corrugated Metal Culverts (Pipes, Arches, Boxes, etc.)

For corrugated metal culverts with sufficient information available to calculate a load rating, a load rating shall be performed with the Ohio Department of Transportation corrugated metal culvert Excel spreadsheets. The load rating results shall be documented on the LRS found in *Appendix 6.1.1 or 6.1.3*.

If the inventory rating tons for the HS-20 or HL-93 exceeds 99.9 tons, it is reasonable to assume that live load has little effect on the structure. In this case, the Engineering Judgment LRS, found in in *Appendix 6.1.7*, shall be used to document the rating. The inventory and operating ratings for the HS-20 will be input as 99.9 tons in accordance with the guidance for Items 64 and 66 found in the *Idaho Bridge Inspection Coding Guide, January 2014*, for structures under sufficient fill that live load is negligible. For structures designed by LRFD after October 1, 2010, the HL-93 inventory and operating rating factors will be input as 2.77.

### 6.0.7.7—Railroad Flatcar & Boxcar Bridges

Railroad flatcar and boxcar bridges shall be load rated using the engineering judgment procedure in *Article 6.1.4*.

## 6.1—SCOPE

The *Idaho Manual for Bridge Evaluation (IMBE)* is intended to supplement and provide interpretation for the *AASHTO Manual for Bridge Evaluation (MBE)*. Part A incorporates provisions specific to the Load and Resistance Factor Rating method and Part B is specific to the Allowable Stress and Load Factor methods of evaluation.

### 6.1.1—Assumptions

All load rating assumptions used in the load rating model shall be documented. It is preferable to have the assumptions listed in the remarks on the LRS form, however due to space constraints it is acceptable to document the load rating assumptions in the supporting calculations.

### 6.1.2—Condition of Bridge Members

If the most recent inspection report indicates deterioration significant enough to affect the live load carrying capacity of the bridge, it should be noted in the remarks section of the LRS form. For consultant load ratings, deterioration of the load rating, if necessary, shall be modeled by the ITD Load Rating Engineer unless otherwise approved by ITD. For some guidelines on coding thresholds see *Article 6A.4.2.3*.

For timber bridges rated under the ASR method, it is appropriate for consultant and ITD load raters to use a Shear Stress Factor, $C_H$, that corresponds to the condition of the splits or cracks noted on the inspection report. The $C_H$ value used in the load rating shall be stated in the remarks on the LRS form.

### 6.1.3—Evaluation Methods

The rating method to be used is dictated by the design method used. See *Table 6.1.3-1* for the rating method required.

**Table 6.1.3-1 Required Rating Method**

| **Design Method** | **Rating Method** |
|---|---|
| Allowable Stress (ASD) | timber structures - ASR<br>all other structure types - LFR |
| Load Factor (LFD) | timber structures - ASR<br>all other structure types - LFR |
| Load and Resistance Factor (LRFD) | all structure types - LRFR[a] |
| combination of design methods | timber components - ASR<br>all other components - LFR |

[a] *BrR*™ version 6.4 and version 6.5 cannot rate LRFD timber bridges under the LRFR method. Contact the ITD Load Rating Engineer for guidance.

### 6.1.4—Bridges with Unknown Structural Components

For bridges with unknown details, an exhaustive search for plans and shop drawings shall be conducted and documented. If the details required for load rating cannot be located, a load rating by engineering judgment shall be performed for a HS truck using the following procedures. This shall be documented using the Engineering Judgment LRS form shown in *Appendix 6.1.5*. Load ratings by engineering judgment must be performed by a licensed Professional Engineer.

Recommended values for inventory/operating rating factors and inventory/operating ratings in tons are given in *Table 6.1.4-1*. The inventory rating (IR) shall be reported as NBI Item #66, the operating rating (OR) shall be reported as NBI Item #64.

**Table 6.1.4-1 Inventory and Operating Ratings by NBI Condition Rating**

| **Lowest NBI Condition Rating**[a] | **Rating Factor** | | **Rating in Tons**[b] | |
|---|---|---|---|---|
| | **IR** | **OR** | **IR**[b] | **OR**[b] |
| 9 | 1.00 | 1.67 | 36 | 60 |
| 8 | 1.00 | 1.67 | 36 | 60 |
| 7 | 0.86 | 1.45 | 31 | 52 |
| 6 | 0.64 | 1.06 | 23 | 38 |
| 5 | 0.50 | 0.84 | 18 | 30 |
| 4[c] | 0.33 | 0.56 | 12 | 20 |
| 3[c] | 0.17 | 0.28 | 6 | 10 |
| 2[c] | 0.08 | 0.09 | 3 | 3 |
| 1 or 0[c] | 0 | 0 | 0 | 0 |

[a] Choose the lowest NBI Condition Rating for either the #59 (Superstructure), #60 (Substructure), or #62 (Culvert). NBI Item #58 (Deck) does not apply to this policy.
[b] IR and OR are based on the HS-20 truck with a weight (W) of 36 Tons.
[c] Shaded areas where the Condition Rating for the Superstructure, Substructure or Culvert is 4 or less indicate that weight limit posting for State legal loads may be considered.

Careful consideration should also be given to the specific *BrM*™ Element Condition States and their corresponding notes in the inspection report. Concrete slabs in Condition State 5 and reinforced concrete and prestressed beams with quantities in Condition State 4 may be considered for lower load rating values.

Coding of the NBI Items in *BrM*™ shall be as shown in *Table 6.1.4-2*.

**Table 6.1.4-2 *BrM*™ Inputs for Engineering Judgment Ratings**

| **NBI Item #** | **NBI Item Name** | ***BrM*™ Input** |
|---|---|---|
| 63 | Operating Method | 0 - Field Eval./Engr. Judgment |
| 64 | Operating Rating | Operating Rating (Tons) |
| 65 | Inventory Method | 0 - Field Eval/Engr. Judgment |
| 66 | Inventory Rating | Inventory Rating (Tons) |

$$RT = RF \times W \qquad (6.1.4\text{-}1)$$

*RT = Rating in tons for HS truck rounded down the nearest whole ton*
*RF = Rating factor for HS truck*
*W = Weight in tons of HS truck*

Load ratings for State legal loads shall not be performed, unless at least one of the NBI Items #58 (Deck), #59 (Superstructure), #60 (Substructure), or # 62 (Culvert) is coded as 4 or less and/or engineering judgment concludes that weight limit posting is required.

#### 6.1.4.1—Corrugated Metal Pipe and Arches

For corrugated metal pipe and arches with unknown details, an exhaustive search for plans and shop drawings shall be conducted. If plans cannot be located, it may be possible to field measure the metal pipe and perform a load rating using the Ohio Department of Transportation corrugated metal pipe Excel spreadsheet. If field measurements cannot be obtained or measurements are insufficient to calculate load capacity, a load rating by engineering judgment shall be performed as outlined in *Article 6.1.4*.

#### 6.1.4.2—Steel and Timber Bridges

For steel and timber bridges where design plans cannot be located, the rating shall be based on field measurements. Self-weight loads of field-measured structural members shall be increased by ten percent to account for uncertainties in the measured dimensions. If the bridge exhibits significant deterioration or other structural problems with a steel or timber bridge, the procedures listed in *Article 6.1.4* for a load rating by engineering judgment may be performed.

### 6.1.5—Component-Specific Evaluation

#### 6.1.5.1—Decks

Concrete bridge decks with an NBI rating of 5 or greater need not be evaluated for load capacity. If the deck NBI rating is a 4 or less, consideration should be given to evaluating the bridge deck, if plans are available. For consultant load ratings, the concrete bridge deck rating model shall be done by the ITD Load Rating Engineer unless otherwise approved.

Timber bridge decks and corrugated metal bridge decks shall be evaluated for load capacity using the *BrR*™ software regardless of their condition.

#### 6.1.5.2—Substructures

Substructures are not routinely evaluated. If the substructure NBI rating is a 4 or less, consideration should be given to evaluating the substructure if plans are available. For consultant load ratings, the substructure rating model shall be done by the ITD Load Rating Engineer unless otherwise approved.

### 6.1.8—Qualifications and Responsibilities

A registered Professional Engineer licensed in the state of Idaho shall be charged with the overall responsibility for the load rating per *Article 6.0.6*.

### 6.1.9—Documentation of Load Rating

The original LRS shall be placed in the appropriate bridge inspection file. A copy of the LRS, the electronic LRS, and supporting calculations shall be placed in the bridge rating files. The *BrR*™ model shall be maintained in the *BrR*™ database by the ITD Load Rating Engineer. Load rating models utilizing approved software other than *BrR*™ shall be maintained by the ITD Load Rating Engineer.

## PART A—LOAD AND RESISTANCE FACTOR RATING

### 6A.1—INTRODUCTION

All new bridges designed under the LRFD code shall be load rated by the LRFR method. Refer to the *BDM Article 0.3* and *Article 0.4* for submittal procedures on load rating of new bridges and bridge rehabilitation projects and *IMBE Article 6.04 – Required Deliverables* for details on the load rating submittal documentation requirements.

Present practice for BAM is to perform evaluations for LRFD bridges using both the LRFR and LFR methods. This is because ITD is currently using LFR to make posting and permitting decisions. For consultant load ratings using the LRFR method, the LFR shall be performed by BAM load rating staff.

### 6A.1.2—Scope

Part A details procedures for load rating bridges for the LRFD design loading, State legal loads and permit loads. The LRFR shall be consistent with the philosophy and approach of the *AASHTO LRFD Bridge Design Specifications* and the most current version of the *BDM.*

### 6A.1.5—Load and Resistance Factor Rating

For LRFD bridges load rated prior to the inventory bridge inspection, the load rating results for the design vehicle shall be placed on the LRFR Bridge LRS form, an example is shown in *Appendix 6.1.1*. The legal and permit live load factors, $\gamma_{LL}$, are based on Average Daily Truck Traffic (ADTT). As ADTT will be unknown until the initial bridge inspection, the legal and permit load rating results shall be left blank.

For LRFD bridges already on the State Bridge Inventory, the load rating results shall be placed on the LRFR Bridge LRS found in *Appendix 6.1.1* and shall include the design vehicle, legal and permit load rating results. The legal and permit rating results shall be based on the most recent ADTT to determine the appropriate legal and permit live load factors, $\gamma_{LL}$. The ADTT can be calculated based on NBI Items 29 - ADT and 109 – % ADTT.

If no changes to the bridge occur during construction which would affect the initial LRFR design vehicle load rating results, the BAM staff shall complete the legal and permit load ratings in accordance with *Article 6.0.2*. The bridge designer shall email the ITD Load Rating Engineer stating no changes occurred during construction which would affect the results.

If changes do occur which would affect the rating results, the bridge load rating shall be updated by the bridge designer. If traffic data from the inventory bridge inspection is available at the time of the updated load rating, the updated LRFR Bridge LRS shall include the design vehicle, legal and permit load rating results. The legal and permit rating results shall be based on the most recent ADTT to determine the appropriate legal and permit live load factors, $\gamma_{LL}$.

## 6A.2—LOADS FOR EVALUATION

### 6A.2.2—Permanent Loads and Load Factors

#### 6A.2.2.1—Dead Loads: *DC* and *DW*

All dead load computations shall be documented in the *BrR*™ model or supporting calculations. The girder self-weight and composite deck dead loads need not be documented unless providing independent calculations to verify the design load rating (Refer to *Article 6.0.6*).

The dead loads should be entered into the *BrR*™ model under separate Load Case Descriptions (i.e. Asphalt, Parapet, Sign Post, etc.). The use of Load Case Descriptions entitled “Composite” or “Non-Composite” is highly discouraged as it is causes problems when updating the model for rehabilitation, repair or other condition changes.

Dead loads to be used in load rating of existing structures shall include the existing loads as noted in the plans and inspection report. Wearing surface dead load shall be based on the thickness of wearing surface noted on the most recent inspection report.

When material unit weights are not listed on the plans, dead load calculations shall be in accordance with *Table 3.5.1-1* of the most current edition of the *AASHTO LRFD Bridge Design Specifications* except as listed in *Table 6A.2.2.1-1*.

**Table 6A.2.2.1-1 Generic Material Unit Weights**

| Material | Unit Weight (kcf) |
|---|---|
| Asphalt Wearing Surface | 0.140 |
| Granular Fill (≤3' below pavement) | 0.140 |
| Granular Fill (>3' below pavement) | 0.125 |
| Concrete | 0.150 |

Dead loads to be used in the load rating submitted with the PS&E package for a new bridge shall be the loads that are expected to be on the bridge at the completion of construction. Once construction has been complete, the load rating shall be updated by the bridge designer if necessary to reflect the as-built conditions.

Future loads shall not be included in the load rating (ex: future wearing surface, future utilities, etc.). Only vertical load effects shall be considered in the load rating analysis, no consideration shall be given to transverse loading. Composite dead loads shall be equally distributed to all girders. Non-composite dead loads shall be distributed by tributary area.

For bridges constructed with precast elements connected by shear keys, weld tabs, and/or tie rods, it shall be assumed that the connectivity is only enough to prevent relative vertical displacement at the interface and no distribution of dead loads shall be allowed. Special circumstances may warrant dead load distribution in a manner different than described above. Permission for an alternate dead load distribution shall be obtained from the ITD Load Rating Engineer.

For steel bridges composed of rolled shapes or welded plate girders, self-weight loads shall be increased by five percent if shop drawings are available and ten percent when there are no shop drawings. For built-up steel members, the self-weight loads shall be increased by ten percent. For steel trusses with member forces listed on the plans, self-weight loads shall be increased by a percentage that causes the load rating model to see dead load forces as close to those shown on the plans as possible. For steel truss members that do not have forces listed on the plans, the self-weight loads shall be increased by ten percent. The intent of the self-weight increase is to account for incidental items such as bolts and rivets. Weights of items such as stiffeners and splice plates must be put into the BrR model as member loads.

For all bridge ratings based on bridge measurements from field sketches, the self-weight loads shall be increased by ten percent.

#### 6A.2.2.3—Load Factors

Load factors for permanent loads are as given in *Table 6A.4.2.2-1*. The load factor, $\gamma_{DW}$, for field-measured wearing surfaces shall be taken as 1.50.

### 6A.2.3—Transient Loads

Wind load, temperature effects, earthquake effects, creep, and shrinkage effects shall not be considered during load ratings. Pedestrian live loads shall not be considered simultaneously with vehicular loads.

#### 6A.2.3.1—Vehicular Live Loads (Gravity Loads): *LL*

The live load models for LRFR load ratings shall be evaluated under the rating criteria listed in *Table 6A.2.3.1-1* or *Table 6A.2.3.1-2*. Schematics of the Idaho trucks can be found in *Appendix 6.2.1—Idaho Legal Truck Schematics*, and *Appendix 6.2.2—121Kip Truck Schematic*.

**Table 6A.2.3.1-1 Required Rating Results for LRFR Completed Prior to Inventory Bridge Inspection**

| Live Load | Inventory Rating | Operating Rating | Legal Rating | Permit Rating |
|---|---|---|---|---|
| HL - 93 (English Units) | X | X | | |

**Table 6A.2.3.1-2 Required Rating Results for LRFR Completed After the Inventory Bridge Inspection**

| Live Load | Inventory Rating | Operating Rating | Legal Rating | Permit Rating |
|---|---|---|---|---|
| HL - 93 (English Units) | X | X | | |
| Idaho Type 3 | | | X | X |
| Idaho Type 3S2 | | | X | X |
| Idaho Type 3-3 | | | X | X |
| Idaho 121 kip | | | X | X |
| NRL | | | X[a] | X |

[a] If the legal rating for the NRL is less than 1.0, the legal tonnages for the SU4, SU5, SU6, and SU7 vehicles must be reported on the LRS.

#### 6A.2.3.2—Application of Vehicular Live Load

Roadway widths less than 20 feet shall be rated for one lane of traffic.

## 6A.4—LOAD RATING PROCEDURES

### 6A.4.1—Introduction

LRFR ratings shall be reported in rating factors and rating tonnages as shown on the LRS in *Appendix 6.1.1*.

## 6A.4.2—General Load Rating Equation

### 6A.4.2.2—Limit States

**Table 6A.4.2.2-1 Limit States and Load Factors for Load Rating**

| Bridge Type | Limit State[a] | Dead Load | Dead Load[b] | Design Load | | Legal Load | Permit Load |
|---|---|---|---|---|---|---|---|
| | | | | Inventory | Operating | | |
| | | $\gamma_{DC}$ | $\gamma_{DW}$ | $\gamma_{LL}$ | $\gamma_{LL}$ | $\gamma_{LL}$ | $\gamma_{LL}$ |
| Steel | Strength I | 1.25 | 1.50 | 1.75 | 1.35 | MBE Tables 6A.4.4.2.3a-1 and 6A.4.4.2.3b-1 | -- |
| | Strength II | 1.25 | 1.50 | -- | -- | -- | MBE Table 6A.4.5.4.2a-1 |
| | Service II | 1.00 | 1.00 | 1.30 | 1.00 | 1.30 | 1.00[c] |
| | Fatigue[d] | 0.00 | 0.00 | -- | -- | -- | -- |
| Reinforced Concrete | Strength I | 1.25 | 1.50 | 1.75 | 1.35 | MBE Tables 6A.4.4.2.3a-1 and 6A.4.4.2.3b-1 | -- |
| | Strength II | 1.25 | 1.50 | -- | -- | -- | MBE Table 6A.4.5.4.2a-1 |
| | Service I[e] | 1.00 | 1.00 | -- | -- | -- | 1.00[c] |
| Prestressed Concrete | Strength I | 1.25 | 1.50 | 1.75 | 1.35 | MBE Tables 6A.4.4.2.3a-1 and 6A.4.4.2.3b-1 | -- |
| | Strength II | 1.25 | 1.50 | -- | -- | -- | MBE Table 6A.4.5.4.2a-1 |
| | Service III | 1.00 | 1.00 | 0.80 | -- | 1.00[c] | -- |
| | Service I | 1.00 | 1.00 | -- | -- | -- | 1.00[c] |
| Wood | Strength I | 1.25 | 1.50 | 1.75 | 1.35 | MBE Tables 6A.4.4.2.3a-1 and 6A.4.4.2.3b-1 | -- |
| | Strength II | 1.25 | 1.50 | -- | -- | -- | MBE Table 6A.4.5.4.2a-1 |

[a] Defined in the AASHTO LRFD Bridge Design Specifications.

[b] The load factor for DW at the strength limit state shall be taken at 1.50, even though the wearing surface is field measured on all ITD structures.

[c] Shaded cells of the table indicate optional checks. All optional Legal and Permit Load checks shall use the live load factor shown in *Table 6A.4.2.2-1*.

[d] The fatigue limit state for Steel need not be checked.

[e] Service I is used to check the 0.9 $F_y$ stress limit in reinforcing steel.

### 6A.4.2.3—Condition Factor: $\varphi_c$

Use $\varphi_c = 1.0$ for bridge components that have NBI ratings in accordance with *Table 6A.4.2.3-1*.

**Table 6A.4.2.3-1NBI Coding Thresholds for Use of $\varphi_c = 1.0$**

| **NBI Item** | **NBI Coding** |
|---|---|
| (58) Deck | 5 or greater |
| (59) Superstructure | 5 or greater |
| (60) Substructure | 5 or greater |
| (62) Culvert | 6 or greater |

The BAM load rating staff may assign a value of $\varphi_c$ less than 1.0 for a bridge component if the NBI coding is not in accordance with *Table 6A.4.2.3-1*. Consultant load rating engineers shall use $\varphi_c = 1.0$ in the load rating model. If the NBI coding for a bridge is not in accordance with *Table 6A.4.2.3-1*, a note should be made in the remarks on the LRS form.

## 6A.5—CONCRETE STRUCTURES

For specifics on the rating models for concrete members, see the following articles:
*6.0.7.1 – Prestressed Girders*
*6.0.7.3 – Reinforced Concrete Girders*
*6.0.7.4 – Reinforced Concrete Frames and Box Structures*

### 6A.5.8—Evaluation for Shear

Reinforced concrete and prestressed bridge members shall be evaluated for shear for the design live loads, state legal live loads and permit live loads.

The Shear Computation Method under the LRFR Control Options in the *BrR*™ model can be set to any method (General Procedure, Simplified Procedure, or Simplified Procedure – Vci, Vcw). It may be preferable to use the same shear computation method in the analysis that was used in the original bridge design calculations.

### 6A.5.12—Rating of Reinforced Concrete Box Culverts

Refer to *Article 6.0.7.4*.

## 6A.6—STEEL STRUCTURES

For specifics on the rating models for steel members, see the following articles:

*Article 6.0.7.2 – Steel Girders*
*Article 6.0.7.5 – Corrugated Metal Decks and Concrete Filled Grid Decks*

## 6A.8—POSTING OF BRIDGES

Posting decisions are not made based on LRFR. See *Article 6B.7* for posting procedures.

## PART B—ALLOWABLE STRESS RATING AND LOAD FACTOR RATING

## 6B.5—NOMINAL CAPACITY: *C*

### 6B.5.2—Allowable Stress Method

#### 6B.5.2.7—Timber

When timber properties are not provided, beam stresses shall be based on values listed for the wood type in the *National Design Specification for Wood Construction* (NDS) referenced in the *AASHTO Standard Specifications for Highway Bridges, 17$^{th}$ Edition*. If the species is not indicated in the plans or field sketches, Western Larch or Douglas Fir shall be assumed. For treated lumber, coastal region Douglas Fir – Larch shall be assumed. Timber stresses shall be based on the West Coast Lumber Inspection Bureau (WCLIB) rules for grading. If not provided, timber Number 1 commercial grade shall be assumed for the girders, and Number 2 commercial grade for decks.

### 6B.5.3—Load Factor Method

#### 6B.5.3.1—Structural Steel

When steel properties are not provided, the following yield strength, $F_y$, shall be used:

**Table 6B.5.3.1-1Yield Strength Based on Year of Construction**

| Year of Construction | $F_y$ (psi) |
|---|---|
| Prior to 1905 | 26,000 |
| 1905 to 1935 | 30,000 |
| 1936 to 1963 | 33,000 |
| After 1963 | 36,000 |

#### 6B.5.3.2—Reinforced Concrete

For specifics on the rating models for reinforced concrete members, see the following articles:
*6.0.7.3 – Reinforced Concrete Girders*
*6.0.7.4 – Reinforced Concrete Frames and Box Structures*

When reinforcing steel properties are not provided, the following yield strength, $f_y$, shall be used:

**Table 6B.5.3.2-1 Yield Strength by Type of Reinforcing Steel**

| Type of Reinforcing Steel | $f_y$ (psi) |
|---|---|
| Unknown prior to 1954 | 33,000 |
| Structural Grade | 36,000 |
| Billet or Intermediate Grade or Unknown after 1954 (Grade 40) | 40,000 |
| Rail or Hard Grade (Grade 50) | 50,000 |
| Grade 60 | 60,000 |

When concrete properties are not provided, the following ultimate strength, $f'_c$, shall be used:

**Table 6B.5.3.2-2 Ultimate Strength by Year of Construction**

| Year of Construction | $f'_c$ (psi) |
|---|---|
| Prior to 1959 | 2,500 |
| 1959 and later | 3,000 |

#### 6B.5.3.3—Prestressed Concrete

For specifics on the rating models for prestressed concrete members, see *Article 6.0.7.1*. When prestressed concrete properties are not provided, the following ultimate strength, $f'_c$, shall be used:

**Table 6B.5.3.3-1 Ultimate Strength by Year of Construction for Prestressed Concrete**

| Year of Construction | $f'_c$ (psi) |
|---|---|
| Prior to 1959 | 3,000 |
| 1959 and later | 3,500 |

When the type of prestressing strand is unknown, stress relieved strands should be assumed and the following tensile strength, $f_{pu}$, shall be used:

**Table 6B.5.3.3-2 Tensile Strength by Year of Construction for Prestressed Concrete**

| Year of Construction | $f_{pu}$ (psi) |
|---|---|
| Prior to 1963 | 232 |
| 1963 and later | 250 |

## 6B.6—LOADINGS

Wind load, temperature effects, earthquake effects, creep, and shrinkage effects shall not be considered during load ratings. Pedestrian live loads shall not be considered simultaneously with vehicular loads.

### 6B.6.1—Dead Load: *D*

The provisions of *Article 6A.2.2.1* shall apply for Load Factor and Allowable Stress Ratings.

### 6B.6.2—Rating Live Load

The live load models for LFR and ASR load ratings shall be evaluated under the rating criteria listed in *Table 6B.6.2-1*. Schematics of the Idaho trucks can be found in *Appendix 6.2.1 (*Idaho Type 3, 3S2, and 3-3*)* and *Appendix 6.2.2 (*121Kip truck*)*.

**Table 6B.6.2-1 Required Rating Results for ASR and LFR**

| Live Load | Inventory Rating | Operating Rating |
|---|---|---|
| Design Truck Shown on Plans[a] | X | X |
| HS-20 | X | X |
| Idaho Type 3 | X | X |
| Idaho Type 3S2 | X | X |
| Idaho Type 3-3 | X | X |
| Idaho 121 kip | X | X |
| NRL | X | X[b] |

[a] If the design truck shown on the plans is the HS-20, this line shall be left blank on the LRS form.
[b] If the operating rating for the NRL is less than 1.0, operating tonnages for the SU4, SU5, SU6, and SU7 vehicles must be reported on the LRS.

#### 6B.6.2.2—Truck Loads

Roadway widths less than 20 feet shall be rated for one lane of traffic.

### 6B.6.3—Distribution of Loads

The live load bending moment for each interior stringer shall be determined by applying to the stringer the fraction of a wheel load (both front and rear) determined in Table 6B.6.3-1.

**Table 6B.6.3-1 Distribution of Wheel Loads in Longitudinal Beams**

| Kind of Floor | Timber Deck Type | Deck Thickness | One Traffic Lane | Two or More Traffic Lanes |
|---|---|---|---|---|
| Timber[a] | Plank[b] | Any | S/4.0 | S/3.75 |
| | Nail Laminated[c] | 4” thick or multiple layer[d] floors over 5” thick | S/4.5 | S/4.0 |
| | | 6” or more thick | S/5.0<br>If S exceeds 5’ use footnote f. | S/4.25<br>If S exceeds 6.5’ use footnote f. |
| | Glued Laminated[e] Panels on Glued Laminated Stringers | 4” thick | S/4.5 | S/4.0 |
| | | 6” or more thick | S/6.0<br>If S exceeds 6’ use footnote f. | S/5.0<br>If S exceeds 7.5’ use footnote f. |
| | Glued Laminated Panel on Steel Stringers | 4” thick | S/4.5 | S/4.0 |
| | | 6” or more thick | S/5.25<br>If S exceeds 5.5’ use footnote f. | S/4.5<br>If S exceeds 7’ use footnote f. |
| **Kind of Floor** | **Beam Type** | | **One Traffic Lane** | **Two or More Traffic Lanes** |
| Concrete | Steel I-Beam stringers[g] and prestressed concrete girder | | S/7.0<br>If S exceeds 10’ use footnote f. | S/5.5<br>If S exceeds 14’ use footnote f. |
| | Concrete T-Beams | | S/6.5<br>If S exceeds 6’ use footnote f. | S/6.0<br>If S exceeds 10’ use footnote f. |
| | Timber stringers | | S/6.0<br>If S exceeds 6’ use footnote f. | S/5.0<br>If S exceeds 10’ use footnote f. |
| | Concrete box girders[h] | | S/8.0<br>If S exceeds 12’ use footnote f. | S/7.0<br>If S exceeds 16’ use footnote f. |
| | Steel box girders | | See 2002 AASHTO Standard Specifications for Highway Bridges, Article 10.39.2. | |
| | Prestressed concrete spread box beams | | See 2002 AASHTO Standard Specifications for Highway Bridges, Article 3.28. | |

S = average stringer spacing in feet.
[a, b, c, d, e, f, g, h, I] For corresponding footnotes, refer to the 2002 AASHTO Standard Specifications for Highway Bridges, Table 3.23.1

**Table 6B.6.3-1 (Continued) Distribution of Wheel Loads in Longitudinal Beams**

| Kind of Floor | Deck Thickness | One Traffic Lane | Two or More Traffic Lanes |
|---|---|---|---|
| Steel Grid | Less than 4” thick | S/4.5 | S/4.0 |
| | 4” or more thick | S/6.0<br>If S exceeds 6’ use footnote f. | S/5.0<br>If S exceeds 10.5’ use footnote f. |
| **Kind of Floor** | **Corrugation Depth** | **One Traffic Lane** | **Two or More Traffic Lanes** |
| Steel bridge corrugated plank[i] | 2” min. depth | S/5.5 | S/4.5 |

S = average stringer spacing in feet.
[a, b, c, d, e, f, g, h, I] For corresponding footnotes, refer to the 2002 AASHTO Standard Specifications for Highway Bridges, Table 3.23.1

## 6B.7—POSTING OF BRIDGES

### 6B.7.1—General

If load rating calculations indicate that any of the State legal loads or SHV loads has an operating rating factor less than 1.0, then the bridge must be load posted for weight restrictions. For a schematic of the Idaho Load Posting trucks see *Appendix 6.2.1*.

ITD and consultant load raters shall routinely load rate state and local government structures and develop recommendations for weight restrictions. Recommendations are to be submitted to the BAME and entered into a database containing all bridge inspection information for each structure (*BrM*™). Recommended postings shall be compared with actual postings to verify whether the structure is properly posted for weight restrictions. If a structure is not properly posted, the procedures outlined in *Articles 6B.7.1.1* and *6B.7.1.2* shall be used.

Bridges not capable of carrying a minimum gross live load weight of three tons at the operating level must be closed.

The authority and responsibility of Bridge Owners to post or restrict bridges is outlined in the following regulations:

- Idaho Statue 40-619
- Idaho Statue 40-1206
- Idaho Statue 10-1207
- 23 CFR 650.307
- 23 CFR 650.313

In situations where a local Bridge Owner does not post or close a bridge in accordance with the policies outlined in the IMBE, ITD may have to take actions to ensure the public’s safety on locally owned highway bridges.

#### 6B.7.1.1—Posting and Closure Procedures of ITD Maintained Structures

When an ITD structure requires closure or load restrictions, and signage and/or barricades are not yet installed or properly installed, the following procedure shall be followed:

1. Notification—The District Engineer and Maintenance Engineer are notified of the posting or closure requirements via phone call or e-mail from the BAME or designee. As a follow-up, a letter prepared by the BAM Engineer is sent

to the District detailing required actions. If load posting is required, the letter shall also contain schematics of the required signs.

2. Action—The District Engineer shall be required to perform the necessary actions to properly load post or close the structure. Bridge closure shall occur within 2 days of notification and load posting shall occur within 10 days. A representative from the District is required to contact the BAME when the posting signs or barricades have been installed. Once BAM is notified that the proper signs and/or barricades have been installed, the *BrM*™ database shall be updated to reflect the actual posting tonnages or closure.

3. Follow Up—If BAM is not notified of compliance within the required timeframes, the District shall be contacted again by either e-mail or phone. The bridge shall be added to the Critical Deficiency Tracking System and continue to be monitored in accordance with *Article 4.8.1.4.4*. The bridge inspector confirms signs are in place and correct at all routine bridge inspections.

**6B.7.1.2—Posting and Closure Procedures of Locally Owned Structures**

When a locally owned structure requires closure or load restrictions, and signage and/or barricades are not yet installed or properly installed, the following procedures shall be followed:

1. Notification— The local agency shall be notified via phone call or email from the BAM Engineer or designee if closure is required. A letter prepared by the BAME shall be sent to the local agency detailing required actions. If load posting is required, the letter shall also contain schematics of the required signs.

2. Action—The local agency shall be required to perform the necessary actions to properly post or close the structure. Bridge closure shall occur within 5 days of notification and posting within 30 days. Certain unforeseen circumstances such as weather-related events may legitimately preclude the local agency from meeting these timelines. In that case the BAM and local agency shall agree to a reasonable date for the posting or closure. The local agency is required to contact the BAME when the posting signs or barricades have been installed.

3. Follow Up—If the local agency fails to notify BAM within the timeframes identified above, a follow-up letter shall be sent by the BAME. At this point the bridge shall be added to the Critical Deficiency Tracking System and shall continue to be monitored in accordance with *Article 4.8.1.4.5*. If the local agency fails to notify BAM within 5 business days that corrective action has been taken, a second follow-up letter shall be sent by the Chief Engineer or designee. This letter shall inform the local agency that Federal and State funds may be suspended until appropriate corrective actions are taken. The FHWA Division Administrator and LHTAC shall be copied on the letter in addition to appropriate ITD personnel. Additionally, the appropriate ITD District Engineer shall be contacted and either he/she or designee shall follow-up with local highway agency personnel and offer assistance to get the bridge properly posted or closed.

Once BAM is notified that the proper signs and/or barricades have been installed, the *BrM*™ database shall be updated to reflect the actual posting tonnages or closure. The bridge inspector confirms proper signs are in place and correct at all routine bridge inspections.

**6B.7.1.3—Emergency Posting of Weight Restrictions on Structures**

In case of bona fide emergencies, the District Engineer or designee shall take the necessary steps to protect the public safety. Examples of emergencies are collision, flood, or fire damage.

Corrective action may be required prior to a complete evaluation by BAM or Bridge Design. Such action may consist of restricting the traffic to certain lanes or posting the structure for no trucks, or only trucks below a specified gross weight.

The offices of Ports of Entry, Motor Carrier, and over legal permits should immediately be verbally notified with a follow-up notification in writing of any temporary restrictions on the State Highway system as well as the time the restrictions are lifted or modified.

### 6B.7.2—Posting Loads

ITD State legal loads are as shown in *Appendix 6.2.1*.

### 6B.7.3—Posting Analysis

If load rating calculations indicate that any of the State legal loads or SHV loads has an operating rating factor less than 1.0, the bridge must be load posted for weight restrictions. The bridge shall be posted based on the procedures detailed in *Articles 6B.7.1.1*, *6B.7.1.2*, and *6B.7.1.3*. The safe load posting shall be based on *Equation 6B.7.3-1*.

*Safe Posting Load = (RF) W* (6B.7.3-1)
*RF = Legal load rating factor*
*W = Weight of rating vehicle*

### 6B.7.4—Regulatory Signs

Load posting signs shall be in accordance with *R12-5* and *R12-6B* as shown in the most current version of the *Idaho Transportation Department Sign Chart*. Closure barricades should conform to *Article 2B.67 of the MUTCD.*

The tonnage listed on the weight limit sign (*R12-5*) will be in accordance with the *Table 6B.7.4-1*.

**Table 6B.7.4-1**

| Vehicle | Tonnage |
|---|---|
| Single Unit Vehicle | Lower of the safe posting load of the Idaho Type 3, SU4, SU5, SU6, SU7, or 27 tons |
| Semi Tractor-Trailer Combination | Lower of the safe posting load for the Idaho Type 3S2 or 42 tons |
| Truck-Trailer Combination | Lower of the safe posting load for the Idaho Type 3-3 or 45 tons |

The tonnage listed on the axle limit sign (*R12-6*) will be the greater of the following, rounded down to the nearest tenth of a ton:

- OR Idaho Type 3 x (9.45 / 27)
- OR Idaho Type 3S2 x (8.75 / 42)
- OR Idaho Type 3-3 x (7.0 / 45)

The weight of the maximum axle on the Idaho Type 3, Idaho Type 3S2, and Idaho Type 3-3 is 9.45 tons, 8.75 tons, and 7.0 tons respectively.

### 6C.1—REFERENCES

Idaho Transportation Department Bridge Design LRFD Manual (BDM), 2014

AASHTO Standard Specifications for Highway Bridges, 17th Edition, 2002

AASHTO LRFD Bridge Design Specification, 7th Edition, 2014

AASHTO Manual for Bridge Evaluation Second Edition, 2014

Manual on Uniform Traffic Control Devices, 2012

# LRFR BRIDGE LOAD RATING SUMMARY

rev. 11/25/2014
Page 1 of 2

| Bridge Key No. | Structure Name | (27) Year Built | Drawing No. | Drawing Date | Date of Analysis |
|---|---|---|---|---|---|
| 25101 | X992320 9.48 | 2013 | 16467 | July 2011 | 11/25/2014 |

| (9) Bridge Location | (7) Facility Carried | (6a) Feature Intersected |
|---|---|---|
| 6.5 N. 2.5 W. Richfield | 1420 North Road | East Main Canal |

| (49) Length | (11) Milepost | (2) District | (3) County | (22) Owner | Administrative Jurisdiction |
|---|---|---|---|---|---|
| 52 ft | 9.480 | 4 | 63 Lincoln | Other Local Agencies | Richfield Hwy. Dist. |

| (45, 43a, 43b) Bridge Description | Design Vehicle (On Plans) | Existing Wearing Surface Type & Depth |
|---|---|---|
| Simple 1 Span PSC Girder Bridge | HL-93 | 4 in. Asphalt (2013 Report) |

| Rating Program & Version | Rating Method | AASHTO Reference |
|---|---|---|
| BrR 6.6.0 - AASHTO Engine | LRFR | The Manual for Bridge Evaluation, Second Edition, 2011 |

| (58) Deck | (59) Superstructure | (60) Substructure | (62) Culvert | (113) Scour Critical |
|---|---|---|---|---|
| 9 Excellent | 9 Excellent | 9 Excellent | N N/A (NBI) | 8 Stable Above Footing |

## INVENTORY AND OPERATING LOAD RATINGS

| Rating Vehicle | Rating Level | Weight (Tons) | Controlling Member | Controlling Location | Controlling Limit State | Rating Factor | Rating (Tons) |
|---|---|---|---|---|---|---|---|
| HL-93 (Truck + Lane Ctrls.) | Inventory | 36 | G2 - Int. Gir. | 1.5 | Strength I - Flexure | 1.11 | 39 |
| HL-93 (Truck + Lane Ctrls.) | Operating | 36 | G2 - Int. Gir. | 1.5 | Strength I - Flexure | 1.43 | 51 |

This LRFR Load Rating is based on: ☐ Design Plans ☑ Design Plans & Approved Shop Drawings ☐ Other (Please explain in Remarks)

Remarks:

*Load rating performed for the girders only.
*Composite dead load was distributed to girders by tributary area.
*Actual wearing surface thickness from the 2013 Inspection Report was input into the rating.
*Current condition assessments, distress and/or deterioration effects, fracture critical detailing, and fatigue were not evaluated.
*The load rating was limited to the vertical load effects only.
*Lump sum girder losses were calculated from the final working force in girder shop drawings.
*Prestressing strand reinforcement was input into BrR using the strand locations given in the girder shop drawings.

Quality Assurance Engineer
Name:
Company:
Date:

Load Rating Engineer
Name:
Company:
Date:

Insert Stamp

The information below is filled out once the ADTT data is entered onto the inspection report. If this bridge has not yet had the initial inspection (i.e. bridge is under development) leave the information below blank. The ADTT value listed below is to be used to establish Legal and Permit $\gamma_{LL}$ factors.

| (30) ADT Year | (29) ADT | (109) Truck % ADT | ADTT (ADT x Truck % ADT) | Legal and Permit Ratings Completed by Name: |
|---|---|---|---|---|
| 2013 | 224 | 13 | 29 | |

| Rating Vehicle | Rating Level | Weight (Tons) | Controlling Member | Controlling Location | Controlling Limit State | Rating Factor | Rating (Tons) |
|---|---|---|---|---|---|---|---|
| Idaho - Type 3 | Legal | 27 | G2 - Int. Gir. | 1.5 | Service III - Concrete Stress | 1.49 | 40 |
| Idaho - Type 3S2 | Legal | 39.5 | G2 - Int. Gir. | 1.5 | Service III - Concrete Stress | 1.78 | 70 |
| Idaho - Type 3-3 | Legal | 39.5 | G2 - Int. Gir. | 1.5 | Service III - Concrete Stress | 1.72 | 67 |
| Idaho - 121k | Legal | 60.5 | G2 - Int. Gir. | 1.5 | Service III - Concrete Stress | 1.45 | 87 |
| NRL | Legal | 40 | G2 - Int. Gir. | 1.5 | Service III - Concrete Stress | 1.13 | 45 |
| Idaho - Type 3 | Permit | 27 | G2 - Int. Gir. | 1.5 | Strength II - Flexure | 2.68 | 72 |
| Idaho - Type 3S2 | Permit | 39.5 | G2 - Int. Gir. | 1.5 | Strength II - Flexure | 3.20 | 126 |
| Idaho - Type 3-3 | Permit | 39.5 | G2 - Int. Gir. | 1.5 | Strength II - Flexure | 3.08 | 121 |
| Idaho - 121k | Permit | 60.5 | G2 - Int. Gir. | 1.5 | Strength II - Flexure | 2.60 | 157 |
| NRL | Permit | 40 | G2 - Int. Gir. | 1.5 | Strength II - Flexure | 2.02 | 80 |

## BRIDGE LOAD RATING SUMMARY

| Controlling Truck | Bridge Factor | Bridge Color | Load Posting Required? | Max Axle Weight if Posting Req. |
|---|---|---|---|---|
| Idaho - Type 3 | 1483 | Interstate | No | N/A |

# LRFR BRIDGE LOAD RATING SUMMARY

rev. 11/25/2014



| Bridge Key No. | Structure Name | (27) Year Built | Drawing No. | Drawing Date | Date of Analysis |
|---|---|---|---|---|---|
| 25101 | X992320 9.48 | 2013 | 16467 | July 2011 | 11/25/2014 |

| (9) Bridge Location | (7) Facility Carried | (6a) Feature Intersected |
|---|---|---|
| 6.5 N. 2.5 W. Richfield | 1420 North Road | East Main Canal |

| (49) Length | (11)Milepost | (2) District | (3) County | (22) Owner | Administrative Jurisdiction |
|---|---|---|---|---|---|
| 52 ft | 9.480 | 4 | 63 Lincoln | Other Local Agencies | Richfield Hwy. Dist. |

| (45, 43a, 43b) Bridge Description | Design Vehicle | Existing Wearing Surface Type & Depth |
|---|---|---|
| Simple 1 Span PSC Girder Bridge | HL-93 | 4 in. Asphalt (2013 Report) |

| Rating Program & Version | Rating Method | AASHTO Reference |
|---|---|---|
| BrR 6.6.0 - AASHTO Engine | LRFR | The Manual for Bridge Evaluation, Second Edition, 2011 |

| (58) Deck | (59) Superstructure | (60) Substructure | (62) Culvert | (113) Scour Critical |
|---|---|---|---|---|
| 9 Excellent | 9 Excellent | 9 Excellent | N N/A (NBI) | 8 Stable Above Footing |

**LEGAL RATINGS - Specialized Hauling Vehicles (SHV)**

(Fill in the below SHV Legal Ratings only when Legal Rating Factor for NRL is less than 1.0)

| Rating Vehicle | Rating Level | Weight (Tons) | Controlling Member | Controlling Location | Controlling Limit State | Rating Factor | Rating (Tons) |
|---|---|---|---|---|---|---|---|
| SU4 | Legal | 27 | | | | | 0 |
| SU5 | Legal | 31 | | | | | 0 |
| SU6 | Legal | 34.75 | | | | | 0 |
| SU7 | Legal | 38.75 | | | | | 0 |

**PERMIT RATINGS - Specialized Hauling Vehicles (SHV)**

(Fill in the below SHV Permit Ratings only when Permit Rating Factor for NRL is less than 1.0)

| Rating Vehicle | Rating Level | Weight (Tons) | Controlling Member | Controlling Location | Controlling Limit State | Rating Factor | Rating (Tons) |
|---|---|---|---|---|---|---|---|
| SU4 | Permit | 27 | | | | | 0 |
| SU5 | Permit | 31 | | | | | 0 |
| SU6 | Permit | 34.75 | | | | | 0 |
| SU7 | Permit | 38.75 | | | | | 0 |

Additional Remarks:

## LRFR Load Rating Summary Form Directions

There are many pull down menus available in the form. Please use these when possible. However, if the desired value cannot be found on the pull down menu it can be typed into the cell.

Section 1: General Bridge Data

- Fill out cells with data as found in the Inspection Report or Structural Inventory and Appraisal. For NBI items, the NBI item numbers are included in the cell title for easy reference.
- If the rating is for a structure that has not yet been built, fill in as much of general bridge data as you can and leave the rest blank. The unknown data will be completed once the structure is built and has been inventoried by the Bridge Inspector.

Section 2: Inventory and Operating Load Ratings

- Rating Vehicles

  The rating vehicle shown on line one and two of this section of the LRS form shall be the HL-93 truck configuration that controls the rating (truck + lane, tandem + lane, or truck pair).

- Controlling Member

  See the following examples for guidance on how to report the controlling member.

| Abbreviation for Form | Abbreviation Meaning |
|---|---|
| G1 – Ext. | Girder 1 -Exterior Girder |
| G2 – Int. | Girder 2 – Interior Girder |
| G3 – Int. w/ Util. | Girder 3 – Interior Girder with utility loads |

Girder name as labeled in rating file (G3)

Short girder description (Int. w/ Util.)

- Controlling Location

  See the following example for guidance on how to report the controlling location.

| Abbreviation for Form | Abbreviation Meaning |
|---|---|
| 1.5 | Span 1 controls at midspan |
| 2.7 | Span 2 controls at the 7th 10th point |

Span number (2)

Tenth point (may be reported out to the 100th if necessary) (.7)

- Rating (Tons)

  This is automatically calculated based on the rating factor and tonnage of the rating vehicle.

- Load Rating Basis

  Please indicate if the load rating is based on Design Plans, Design Plans and Approved Shop Drawings or Other. When “Other” is used, provide an explanation in the remarks (e.g., Approved Shop Drawings only, or Field Measurements).

Section 3: Remarks and Signature

- There is a text box under remarks. Please fill this in with any assumptions that were made for the load rating. If needed, the bottom of page 2 of the LRS has extra room for additional remarks.
- Please fill in the information for the people that worked on the load rating.
- Please have a Professional Engineer licensed in the State of Idaho stamp the final copy. For load ratings completed prior to the inventory inspection, the stamp will only apply to the HL-93 ratings.

Section 4: Legal and Permit Ratings

- Fill in the traffic data per the inspection report. The ADTT shown on this form shall also be used to compute the Legal and Permit Live Load Factors ($\gamma_{LL}$) used in the load rating model.
- If the bridge has not had the inventory inspection, the Legal and Permit Ratings shall be left blank. Once the inventory inspection is completed, the Legal and Permit Ratings shall be completed. If there were design changes during construction requiring modifications to the load rating, the Legal and Permit Ratings shall be completed by the original Load Rater. If there were no changes during construction, ITD staff will complete the Legal and Permit Ratings.
- The Legal and Permit rating vehicles shall be as shown on the LRS form.
- If the Legal and/or Permit Rating Factor for the NRL truck is less than 1.0, refer to Section 7: Legal and Permit Ratings for Specialized Hauling Vehicle (SHV).

Section 5: Bridge Load Rating Summary

- All of the fields in this section are automatically calculated based on the ratings input in Section 4. These fields are related to ITD’s over legal weight permit vehicle screening process and ITD’s Route Capacity Map.

Section 6: General Bridge Data

- The General Bridge Data on page 2 of the LRS will automatically be populated once the General Bridge Data on page 1 is completed.

Section 7: Legal and Permit Ratings for Specialized Hauling Vehicle (SHV)

- If the Legal Rating Factor for the NRL truck is less than 1.0, the Legal Ratings for the four SHV trucks (SU4, SU5, SU6, and SU7) on page 2 of the LRS must be completed. If the Legal Rating Factor for the NRL truck is 1.0 or above, leave the Legal Ratings for the SHV blank.
- If the Permit Rating Factor for the NRL truck is less than 1.0, the Permit Ratings for the four SHV trucks on page 2 of the LRS must be completed. If the Permit Rating Factor for the NRL is 1.0 or above, leave Permit Ratings for the SHV blank.

# ASR/LFR BRIDGE LOAD RATING SUMMARY

rev. 10/29/2014

Page 1 of 2

| Bridge Key No. | Structure Name | (27) Year Built | Drawing Number | Date of Analysis |
|---|---|---|---|---|
| 29195 | X994250 1.98 | 1970 | 16910 | |

| (9) Bridge Location | (7) Facility Carried | (6a) Feature Intersected |
|---|---|---|
| 6.3 N. 5.0 W. Grangeville | McDonald Road | Shebang Creek |

| (49) Length | (11)Milepost | (2) District | (3) County | (22) Owner | Administrative Jurisdiction |
|---|---|---|---|---|---|
| 31 ft. | 101.307 | 2 | 49 Idaho | Other Local Agencies | Fenn Hwy. Dist. |

| (45, 43a, 43b) Bridge Description | Design Vehicle | Existing Wearing Surface Type & Depth |
|---|---|---|
| Simple 1 Span SS Bridge | H-15 | 10" Granular |

| Rating Program & Version | Rating Method | AASHTO Reference |
|---|---|---|
| BrR 6.6 - AASHTO Engine | LFR | The Manual for Bridge Evaluation, Second Edition, 2011 |

| (58) Deck | (59) Superstructure | (60) Substructure | (62) Culvert | (113) Scour Critical |
|---|---|---|---|---|
| 6 Satisfactory | 6 Satisfactory | 6 Satisfactory | N N/A (NBI) | U Unknown Scour |

## INVENTORY RATINGS

| Rating Vehicle | Controlling Configuration | Weight (Tons) | Controlling Member | Controlling Location | Controlling Limit State | Rating Factor | Rating (Tons) |
|---|---|---|---|---|---|---|---|
| H-15 | Truck | 15 | G1 - Ext. Gir. | 1.5 | Service Steel | 0.69 | 10 |
| HS-20 | Truck | 36 | G1 - Ext. Gir. | 1.6 | Service Steel | 0.45 | 16 |
| Idaho - Type 3 | Truck | 27 | G1 - Ext. Gir. | 1.5 | Service Steel | 0.44 | 11 |
| Idaho - Type 3S2 | Truck | 39.5 | G1 - Ext. Gir. | 1.5 | Service Steel | 0.51 | 20 |
| Idaho - Type 3-3 | Truck | 39.5 | G1 - Ext. Gir. | 1.5 | Service Steel | 0.61 | 24 |
| Idaho - 121k | Truck | 60.5 | G1 - Ext. Gir. | 1.5 | Service Steel | 0.48 | 28 |
| NRL | Truck | 40 | G1 - Ext. Gir. | 1.5 | Service Steel | 0.36 | 14 |

## OPERATING RATINGS

| Rating Vehicle | Controlling Configuration | Weight (Tons) | Controlling Member | Controlling Location | Controlling Limit State | Rating Factor | Rating (Tons) |
|---|---|---|---|---|---|---|---|
| H-15 | Truck | 15 | G1 - Ext. Gir. | 1.5 | Service Steel | 1.15 | 17 |
| HS-20 | Truck | 36 | G1 - Ext. Gir. | 1.6 | Service Steel | 0.75 | 27 |
| Idaho - Type 3 | Truck | 27 | G1 - Ext. Gir. | 1.5 | Service Steel | 0.73 | 19 |
| Idaho - Type 3S2 | Truck | 39.5 | G1 - Ext. Gir. | 1.5 | Service Steel | 0.85 | 33 |
| Idaho - Type 3-3 | Truck | 39.5 | G1 - Ext. Gir. | 1.5 | Service Steel | 1.03 | 40 |
| Idaho - 121k | Truck | 60.5 | G1 - Ext. Gir. | 1.5 | Service Steel | 0.80 | 48 |
| NRL (SHV ratings on Pg 2) | Truck | 40 | G1 - Ext. Gir. | 1.5 | Service Steel | 0.61 | 24 |

## BRIDGE LOAD RATING SUMMARY

| Controlling Truck | Bridge Factor | Bridge Color | Load Posting Required? | Max Axle Weight if Posting Req. |
|---|---|---|---|---|
| SU7 | 391 | Red | Yes | 7.3 |

Remarks:

*Load rating performed for the girders only.
*Composite dead load was distributed to girders by tributary area.
*Current condition assessments, distress and/or deterioration effects, fracture critical detailing, and fatigue were not evaluated.
*Actual wearing surface thickness from the Bridge Inspection Field Sketch was input into the rating.
*The load rating was limited to the vertical load effects only.
*The bridge was input into BrR based on information provided on Bridge Inspection Field Sketch by Collins Engineering dated 5/16/2012.
*BrR does not handle steel angle decking, decking was input as a generic deck type matching the thickness of the angle decking, the unit weight was calculated to match the actual weight of the deck.
*Metal angle decking was not load rated.
*Steel properties for girders were unknown. Inspection Report indicated that the bridge was built in 1970 therefore Fy = 36 ksi was used based on guidance from MBE for unknown steel built after 1963.
*Steel girders were assumed to be W18x50. The size was determined based on best matching the girder dimensions provided on the Bridge Inspection Field Sketch with the dimensions of the rolled beam shape per AISC.
* Field Sketch states that metal angle decking was welded to girders; therefore, the girder top flange was assumed to be laterally supported.
*Structural steel girder self weight was increased 10% to account for miscellaneous weight.
*Live load distibution factors for steel girders were calculated based on the lever rule.

Quality Assurance Engineer

Name:
Company:
Date:

Load Rating Engineer

Name:
Company:
Date:

Insert Stamp

# ASR/LFR BRIDGE LOAD RATING SUMMARY

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Page 2 of 2

| Bridge Key No. | Structure Name | (27) Year Built | Drawing Number | Date of Analysis |
|---|---|---|---|---|
| 29195 | X994250 1.98 | 1970 | 16910 | |

| (9) Bridge Location | (7) Facility Carried | (6a) Feature Intersected |
|---|---|---|
| 6.3 N. 5.0 W. Grangeville | McDonald Road | Shebang Creek |

| (49) Length | (11)Milepost | (2) District | (3) County | (22) Owner | Administrative Jurisdiction |
|---|---|---|---|---|---|
| 31 ft. | 101.307 | 2 | 49 Idaho | Other Local Agencies | Fenn Hwy. Dist. |

| (45, 43a, 43b) Bridge Description | Design Vehicle | Existing Wearing Surface Type & Depth |
|---|---|---|
| Simple 1 Span SS Bridge | H-15 | 10" Granular |

| Rating Program & Version | Rating Method | AASHTO Reference |
|---|---|---|
| BrR 6.6 - AASHTO Engine | LFR | The Manual for Bridge Evaluation, Second Edition, 2011 |

| (58) Deck | (59) Superstructure | (60) Substructure | (62) Culvert | (113) Scour Critical |
|---|---|---|---|---|
| 6 Satisfactory | 6 Satisfactory | 6 Satisfactory | N N/A (NBI) | U Unknown Scour |

**OPERATING RATINGS - Specialized Hauling Vehicles (SHV)**
(Fill in the below SHV OperatingRatings only when Operating Rating Factor for NRL is less than 1.0)

| Rating Vehicle | Controlling Configuration | Weight (Tons) | Controlling Member | Controlling Location | Controlling Limit State | Rating Factor | Rating (Tons) |
|---|---|---|---|---|---|---|---|
| SU4 | Truck | 27 | G1 - Ext. Gir. | 1.5 | Service - Steel | 0.77 | 20 |
| SU5 | Truck | 31 | G1 - Ext. Gir. | 1.5 | Service - Steel | 0.72 | 22 |
| SU6 | Truck | 34.75 | G1 - Ext. Gir. | 1.5 | Service - Steel | 0.65 | 22 |
| SU7 | Truck | 38.75 | G1 - Ext. Gir. | 1.5 | Service - Steel | 0.63 | 24 |

**POSTING**

| Vehicle | Schematic | Posting (Tons) |
|---|---|---|
| Single Unit | | 19 |
| Semi Tractor-Trailer Combination | | 33 |
| Truck-Trailer Combination | | 40 |
| | Max Axle | 7.3 |

Additional Remarks:

## LFR Load Rating Summary Form Directions

Section 1: General Bridge Data

- Fill out cells with data as found in the Inspection Report or Structural Inventory and Appraisal. For NBI items, the NBI item numbers are included in the cell title for easy reference.
- If the rating is for a structure that has not yet been built, fill in as much of general bridge data as you can and leave the rest blank. The form will be completed by the Bridge Inspection office once the structure is built and has been inventoried by the Bridge Inspector.

Section 2: Inventory Ratings

- Rating Vehicles

  The rating vehicle shown on line one of the Inventory Ratings section of the LRS form shall be the design vehicle as shown on the plans. If the design vehicle is an HS-20 truck, this cell can be left blank. The rating vehicles on lines 2 thru 7 shall be as shown on the LRS form.

- Controlling Configuration

  The controlling configuration for the H or HS trucks shall be "Lane" if the lane load controls or "Truck" if the axle configuration controls.

- Controlling Member

  See the following examples for guidance on how to report the controlling member.

| Abbreviation for Form | Abbreviation Meaning |
|---|---|
| G1 – Ext. | Girder 1 -Exterior Girder |
| G2 – Int. | Girder 2 – Interior Girder |
| G3 – Int. w/ Util. | Girder 3 – Interior Girder with utility loads |

Girder name as labeled in rating file (G3)

Short girder description (Int. w/ Util.)

- Controlling Location

  See the following example for guidance on how to report the controlling location.

| Abbreviation for Form | Abbreviation Meaning |
|---|---|
| 1.5 | Span 1 controls at midspan |
| 2.7 | Span 2 controls at the $7^{th}$ $10^{th}$ point |

Span number (2)

Tenth point (may be reported out to the $100^{th}$ if necessary) (7)

- Rating (Tons)

  This is automatically calculated based on the rating factor and tonnage of the rating vehicle. The first line will highlight itself if an H truck is selected for the design truck in column 1 of the table. It will not be highlighted if anything other than an H truck is selected for the design truck in column one.

Section 3: Operating Ratings

- See Section 2: Inventory Ratings for directions on how to fill in required cells.
- If the Operating Rating Factor for the NRL truck is less 1.0, the SHV Operating Ratings on page 2 of the LRS must be completed. If the Operating Rating Factor for the NRL is 1.0 and above, it is not necessary to complete the SHV Operating Ratings.

Section 4: Bridge Load Rating Summary

- All of the fields in this section are automatically calculated based on the input in Section 3. These fields are related to ITD's overweight permit vehicle screening process and ITD's Route Capacity Map.

Section 5: Remarks and Signature

- There is a text box under remarks. Please fill this in with any assumptions that were made for the load rating. See below for example remarks.

*Girders were evaluated assuming simple span load distribution.
*Actual wearing surface thickness from the 2014 Inspection Report was input into the rating.
*Current condition assessments, distress and/or deterioration effects, fracture critical detailing, and fatigue were not evaluated except the shear stress factor $C_H$ was assumed to equal 1.0 since the Inspection Report indicated several splits and checks on the girders.
*The load rating was limited to the vertical load effects only.
* Timber was assumed to be Douglas-Fir Larch Grade L2D for the decking per Project Certification of Conformance and Douglas-Fir Larch Dense No. 1 for the girders.
*Assumed no intermediate diaphragms.

- Please fill in the information for the people that worked on the load rating.
- Please have a professional licensed engineer stamp the final copy.

Section 6: General Bridge Data

- The General Bridge Data on page 2 of the LRS will automatically be populated once the General Bridge Data on page 1 is completed.

Section 7: Operating Ratings for Specialized Hauling Vehicle (SHV)

- If the Operating Rating Factor for the NRL truck is less than 1.0, the Operating Ratings for the four SHV trucks (SU4, SU5, SU6, and SU7) on page 2 of the LRS must be completed. If the Operating Rating Factor for the NRL truck is 1.0 or above, leave the Operating Ratings for the SHV blank.

# BRIDGE LOAD RATING SUMMARY
# LOAD RATINGS BY ENGINEERING JUDGMENT

rev. 11/6/2013

| Bridge Key No. | Structure Name | (27) Year Built | (106) Year Reconstruct | Inspection Date |
|---|---|---|---|---|
| 34400 | S04610A 93.38 | 1939 | n/a | |

| (9) Bridge Location | (7) Facility Carried | (6a) Feature Intersected |
|---|---|---|
| 5.5 S. 2 W. Wendell | SH 46 | Cedar Draw Canal |

| (49) Length | (11)Milepost | (2) District | (3) County | (22) Owner | Administrative Jurisdiction |
|---|---|---|---|---|---|
| 13 ft | 93.384 | 4 | 47 Gooding | State Hwy Agency | Dist. 4 |

| (45, 43a, 43b) Bridge Description | (31) Design Load (per SI&A) | Existing Wearing Surface Type & Depth | |
|---|---|---|---|
| 1 Span Concrete Slab | H-15 | 4 in Asphalt | 5 in Granular |

| (58) Deck | (59) Superstructure | (60) Substructure | (62) Culvert | (113) Scour Critical |
|---|---|---|---|---|
| 6 Satisfactory | 6 Satisfactory | 3 Serious | N N/A (NBI) | 6 Calcs Not Made |

| (30) ADT Year | (29) ADT | (109) Truck % ADT | ADTT (ADT x Truck % ADT) | (19) Detour Length | Year Programmed |
|---|---|---|---|---|---|
| 2012 | 2900 | 11 | 319 | 1 mile | 2015 |

## DOCUMENT SEARCH FOR PLANS

All ITD resources were exhausted in search for plans (plan archives, inspection files, design files), but no plans could be located.

## ASSIGNED RATINGS

| Rating Level | Rating Factor | Rating (Tons) |
|---|---|---|
| Inventory | 0.17 | 6 |
| Operating | 0.28 | 10 |

Remarks:

Rating Factors assumed based on lowest of the Superstructure (NBI Item # 59) or Substructure (NBI Item # 60) per Table 6.1.4.1-1 and Table 6.1.4.1-2 of the Idaho Manual for Bridge Evaluation.

## NBI CODING IN PONTIS

| NBI Item # | NBI Item Name | Pontis Input |
|---|---|---|
| 63 | Operating Type | 0 Field Eval/Engr Judge |
| 64 | Operating Rating | 10 |
| 65 | Inventory Type | 0 Field Eval/Engr Judge |
| 66 | Inventory Rating | 6 |

## Load Rating Engineer

| | |
|---|---|
| Name: | |
| Company: | |
| Date: | |

## Quality Assurance Engineer

| | |
|---|---|
| Name: | |
| Company: | |
| Date: | |

## POSTING

| Vehicle | Recommended Post (Tons) |
|---|---|
| Idaho Type 3 | 27 |
| Idaho Type 3S2 | 40 |
| Idaho Type 3-3 | 40 |
| Max Axle | 9 |

Additional remarks and/or justification for ratings assigned based on deterioration of structure:

2013 notes to the BIE read: "County road has been taken over by the state and has become an extension of SH 46. Year built was estimated. Highway district has no plans for this structure. Appears to have been reconstructed at some point as abutments are older than the slab. Bridge needs analyzed for load rating." There is no bridge inspection history on this bridge. Up until 2011 it belonged to the county. Because it is only 13 feet long and was on the local system, ITD did not inspect it.
Left side of abutment has a 1/2" wide crack full height caused by the footing being undermined. This has caused the abutment to settle 1/2" from slab and rotate 3/4 inch from the top. Settlement appears to be stable at this time. Due to estimated age, estimated design vehicle and condition of the structure, it is recommended that it be load posted until the bridge is replaced in 2015.

# BRIDGE LOAD RATING SUMMARY
# LOAD RATINGS BY ENGINEERING JUDGMENT

rev. 11/6/2013

| Bridge Key No. | Structure Name | (27) Year Built | (106) Year Reconstruct | Inspection Date |
|---|---|---|---|---|
| 15192 | S07110A 12.11 | 1989 | n/a | 11/20/2012 |

| (9) Bridge Location | (7) Facility Carried | (6a) Feature Intersected |
|---|---|---|
| 13.8 NW Cambridge | SH 71 | Brownlee Creek |

| (49) Length | (11)Milepost | (2) District | (3) County | (22) Owner | Administrative Jurisdiction |
|---|---|---|---|---|---|
| 12 ft | 12.110 | 3 | 87 Washington | State Hwy Agency | Dist. 3 |

| (45, 43a, 43b) Bridge Description | (31) Design Load (per SI&A) | Existing Wearing Surface Type & Depth | |
|---|---|---|---|
| 1 Span Steel Culvert | HS-25 | 4 in Asphalt | 206 in Granular |

| (58) Deck | (59) Superstructure | (60) Substructure | (62) Culvert | (113) Scour Critical |
|---|---|---|---|---|
| N N/A (NBI) | N N/A (NBI) | N N/A (NBI) | 6 Deterioration | 8 Stable Above Footing |

| (30) ADT Year | (29) ADT | (109) Truck % ADT | ADTT (ADT x Truck % ADT) | (19) Detour Length | Year Programmed |
|---|---|---|---|---|---|
| 2012 | 250 | 24 | 60 | 99 miles | n/a or unknown |

## DOCUMENT SEARCH FOR PLANS

Plans were found under Drawing # 15821. The design plans show a 144" x 72" corrugated metal plate arch with a 0 degree skew (measured normal to the roadway). Depth of fill per plans = 17.55 ft (Elev. @ Road Centerline = 3872.49 ft; Elev. @ Culvert Centerline = 3854.94 ft; 3872.49 ft - 3854.94 ft = 17.55 ft)

## ASSIGNED RATINGS

| Rating Level | Rating Factor | Rating (Tons) |
|---|---|---|
| Inventory | 2.775 | 99.9 |
| Operating | 2.775 | 99.9 |

Remarks:

The effect of live load may be neglected when the depth of fill is more than 8 ft and exceeds the span length per AASHTO Standard Specifications Article 6.4.2. Rating tonnage of 99.9 per Idaho Bridge Inspection Coding Guide Item 64 and Item 66.

## NBI CODING IN PONTIS

| NBI Item # | NBI Item Name | Pontis Input |
|---|---|---|
| 63 | Operating Type | 0 Field Eval/Engr Judge |
| 64 | Operating Rating | 99.9 |
| 65 | Inventory Type | 0 Field Eval/Engr Judge |
| 66 | Inventory Rating | 99.9 |

## Load Rating Engineer

| | |
|---|---|
| Name: | |
| Company: | |
| Date: | |

## Quality Assurance Engineer

| | |
|---|---|
| Name: | |
| Company: | |
| Date: | |

## POSTING

| Vehicle | Recommended Post (Tons) |
|---|---|
| Idaho Type 3 | n/a |
| Idaho Type 3S2 | n/a |
| Idaho Type 3-3 | n/a |
| Max Axle | n/a |

Additional remarks and/or justification for ratings assigned based on deterioration of structure:

There is no previous load rating for this structure.
The structural span of this bridge is 12 feet since the arch culvert measures 144 inch across parallel to the corrugations.
Since the depth of fill is 17.17 feet (206 inch Granular per 2012 Inspection), live load effects have been neglected on this structure per AASHTO Standard Specifications Article 6.4.2.

# BRIDGE LOAD RATING SUMMARY
# LOAD RATINGS BY ENGINEERING JUDGMENT

rev. 11/6/2013

| Bridge Key No. | Structure Name | (27) Year Built | (106) Year Reconstruct | Inspection Date |
|---|---|---|---|---|
| 10457 | S01220D 104.35 | 2009 | n/a | 9/9/2013 |

| (9) Bridge Location | (7) Facility Carried | (6a) Feature Intersected |
|---|---|---|
| 8.2 E. Lowell | US 12 | Apgar Creek |

| (49) Length | (11)Milepost | (2) District | (3) County | (22) Owner | Administrative Jurisdiction |
|---|---|---|---|---|---|
| 10 ft | 104.350 | 2 | 49 Idaho | State Hwy Agency | Dist. 2 |

| (45, 43a, 43b) Bridge Description | (31) Design Load (per SI&A) | Existing Wearing Surface Type & Depth | |
|---|---|---|---|
| 1 Span Multi-plate Steel Arched Culvert | HL-93 | 6 in. Asphalt | 43 in. Granular |

| (58) Deck | (59) Superstructure | (60) Substructure | (62) Culvert | (113) Scour Critical |
|---|---|---|---|---|
| N N/A (NBI) | N N/A (NBI) | N N/A (NBI) | 8 No Major Problem | 8 Stable Above Footing |

| (30) ADT Year | (29) ADT | (109) Truck % ADT | ADTT (ADT x Truck % ADT) | (19) Detour Length | Year Programmed |
|---|---|---|---|---|---|
| 2012 | 590 | 24 | 142 | 99 miles | n/a or unknown |

## DOCUMENT SEARCH FOR PLANS

Plans were found under Drawing # 16063. The design plans show a structural plate arch with a 10-foot span on a 0 degree skew (measured normal to the roadway). Depth of fill per the plans is 3.83 feet at the centerline of the roadway. The Ohio Department of Transportation corrugated metal pipe Excel spreadsheet was initially used to generate a load rating. Although a fill depth of 4.08 feet is listed in the 2013 inspection report, the depth of fill shown on the plans (3.83 ft) was used for the load rating. Per the method used in the spreadsheet, the inventory rating for the HS-20 was 266 tons. If the inventory rating for the HS-20 exceeds 99.9 tons, it is reasonable to assume that live load has little effect on the structure.

## ASSIGNED RATINGS

| Rating Level | Rating Factor | Rating (Tons) |
|---|---|---|
| Inventory | 2.775 | 99.9 |
| Operating | 2.775 | 99.9 |

Remarks:

The HS-20 inventory and operating ratings are being input as 99.9 tons in accordance with *IMBE Article 6.0.7.6* and the guidance for Items 64 and 66 found in *the Idaho Bridge Inspection Coding Guide, January 2014*, for structures under sufficient fill that live load is negligible.

## NBI CODING IN PONTIS

| NBI Item # | NBI Item Name | Pontis Input |
|---|---|---|
| 63 | Operating Type | 0 Field Eval/Engr Judge |
| 64 | Operating Rating | 99.9 |
| 65 | Inventory Type | 0 Field Eval/Engr Judge |
| 66 | Inventory Rating | 99.9 |

## Load Rating Engineer

| | |
|---|---|
| Name: | |
| Company: | |
| Date: | |

## Quality Assurance Engineer

| | |
|---|---|
| Name: | |
| Company: | |
| Date: | |

## POSTING

| Vehicle | Recommended Post (Tons) |
|---|---|
| Idaho Type 3 | n/a |
| Idaho Type 3S2 | n/a |
| Idaho Type 3-3 | n/a |
| Max Axle | n/a |

Additional remarks and/or justification for ratings assigned based on deterioration of structure:

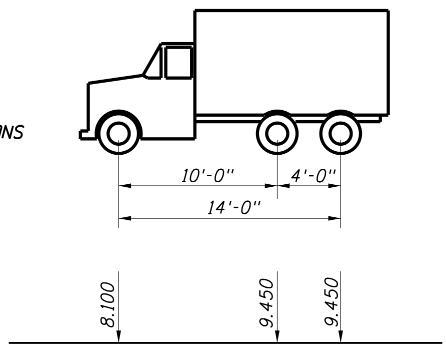
There is no previous load rating for this structure.

3-30-2004

# IDAHO TRANSPORTATION DEPARTMENT

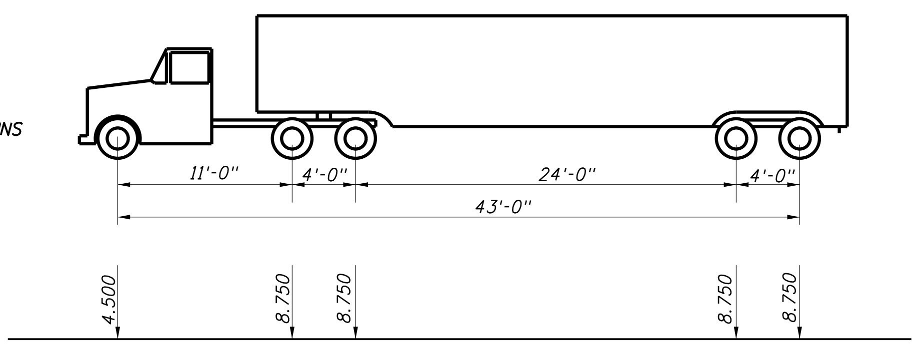
## TYPICAL LEGAL LOAD TYPES FOR CAPACITY RATING & POSTING

TYPE 3 UNIT
WEIGHT = 27.00 TONS

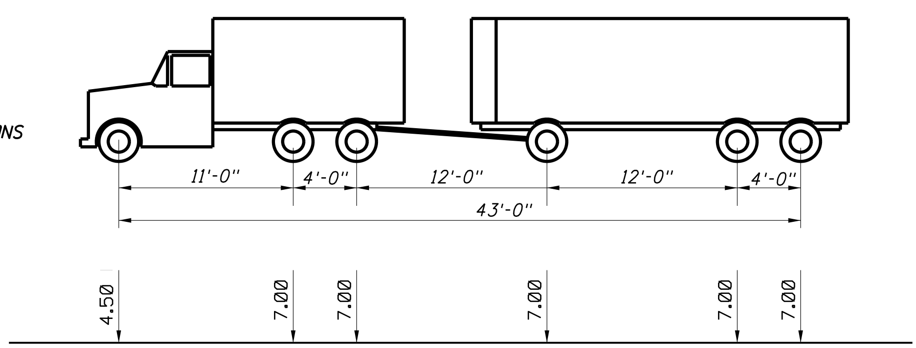



NOTE: INDICATED CONCENTRATIONS ARE WHEEL LOADS IN KIPS OR AXLE LOADS IN TONS.

TYPE 3S2 UNIT
WEIGHT = 39.50 TONS




TYPE 3-3 UNIT
WEIGHT = 39.50 TONS



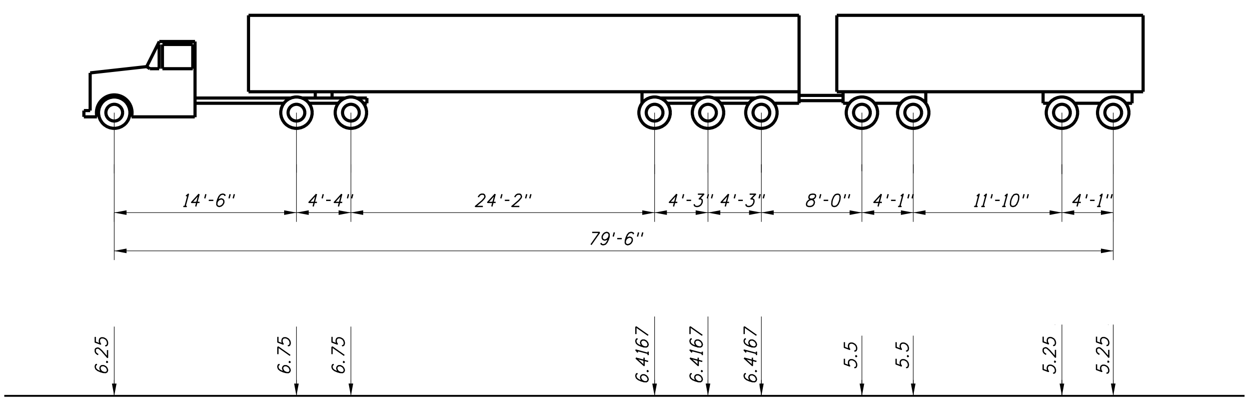
3-30-2004

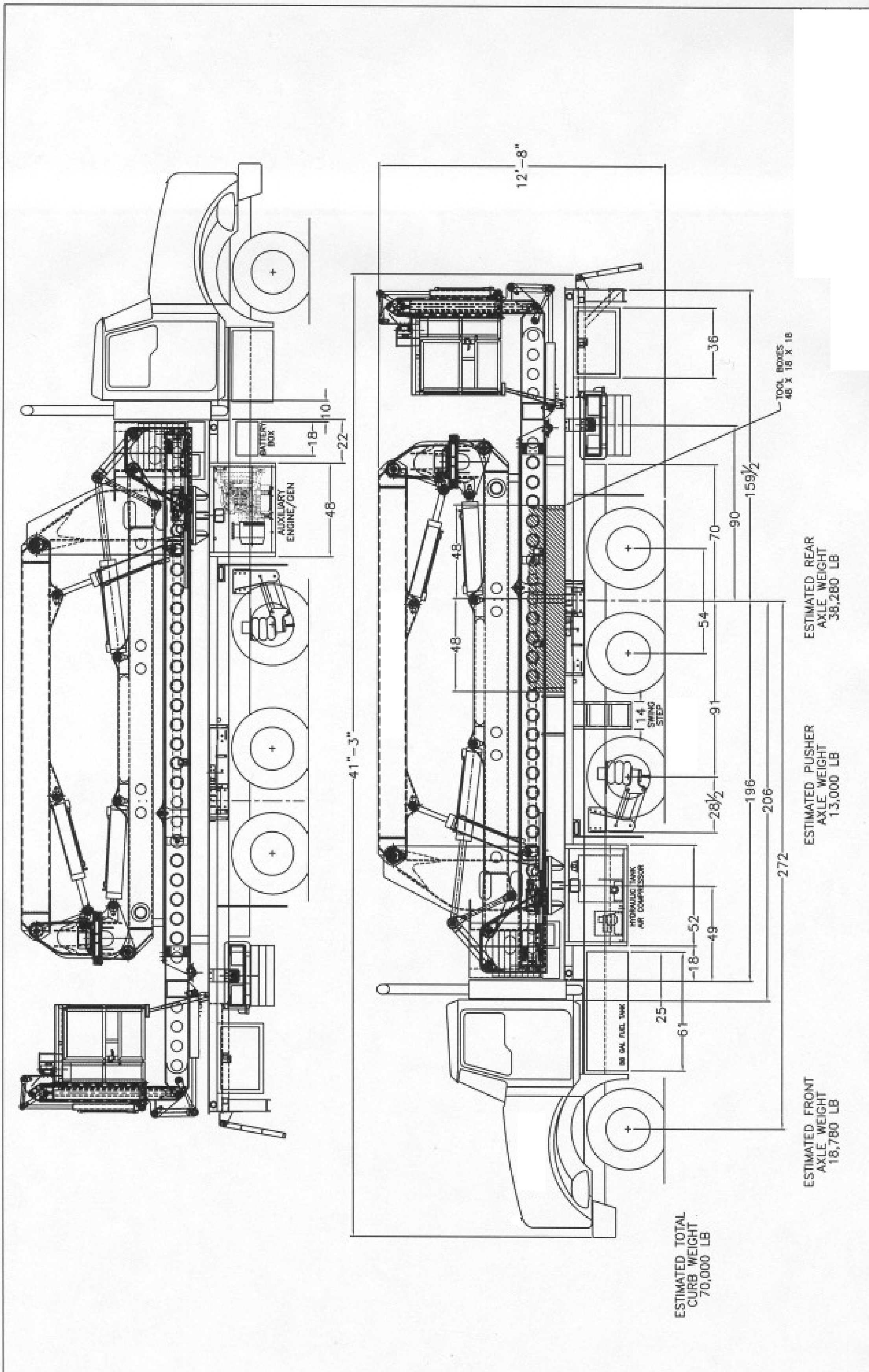
# IDAHO TRANSPORTATION DEPARTMENT

## 121 KIP TRUCK FOR CAPACITY RATING

IDAHO 121 UNIT
WEIGHT = 60.5 TONS

NOTE: INDICATED CONCENTRATIONS ARE WHEEL LOADS IN KIPS OR AXLE LOADS IN TONS.



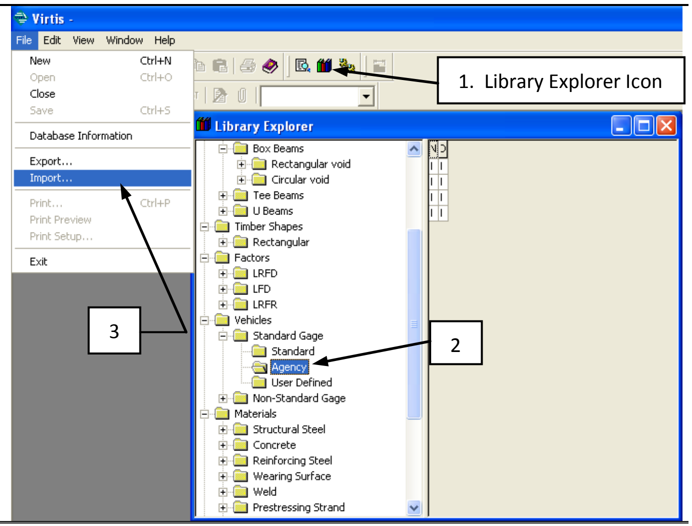

12'-8"
41'-3"
BATTERY BOX
AUXILIARY ENGINE/GEN
TOOL BOXES 48 X 18 X 18
SWING STEP
HYDRAULIC TANK AIR COMPRESSOR
ESTIMATED REAR AXLE WEIGHT 38,280 LB
ESTIMATED PUSHER AXLE WEIGHT 13,000 LB
ESTIMATED FRONT AXLE WEIGHT 18,780 LB
ESTIMATED TOTAL CURB WEIGHT 70,000 LB

# *VIRTIS™ SETUP

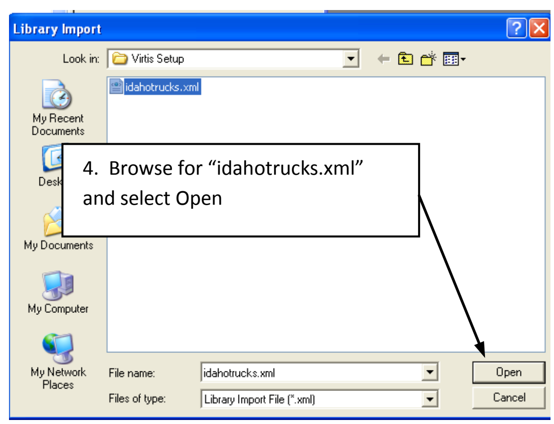
## IMPORTING TRUCKS INTO VIRTIS™ LIBRARY

*Note: All instructions and screenshots were made using Virtis™ version 6.3 or earlier.

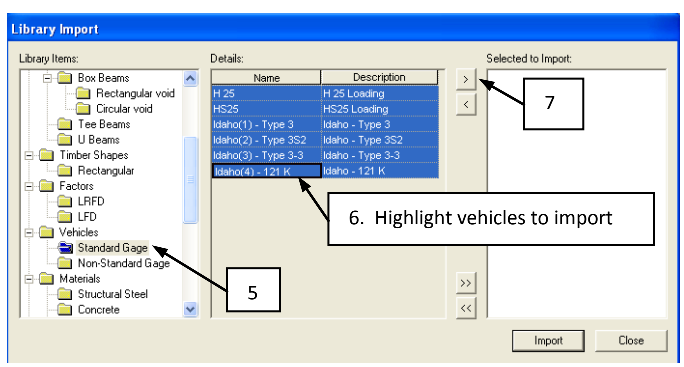
1. Click on the *Library Explorer Icon* on the tool bar at the top of the screen.
2. Select *Vehicles* ➔ *Standard Gage* ➔ *Agency* from the Library Explorer tree.
3. Select *File* ➔ *Import* on the top row of the Menu Bars




4. Locate the file "idahotrucks.xml" and select *Open* (this file may be obtained by contacting the ITD Load Rating Engineer)

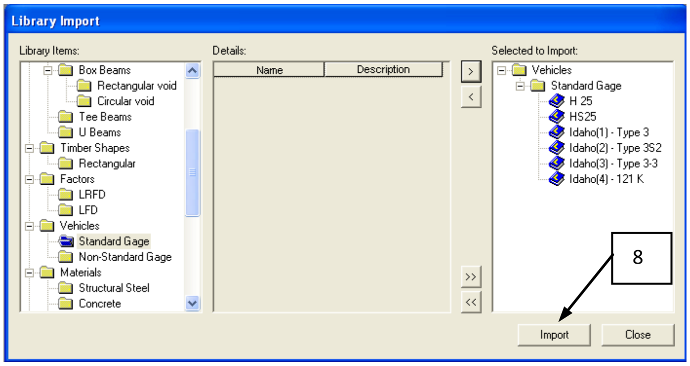



5. Find *Standard Gage* under *Vehicles* in the Library window.
6. Highlight the vehicles to import in the *Details*: window.
7. Select the ">" button and the vehicle will move to the *Selected to Import* window.



8. When all vehicles have been moved to the *Selected to Import* window, select the Import button.

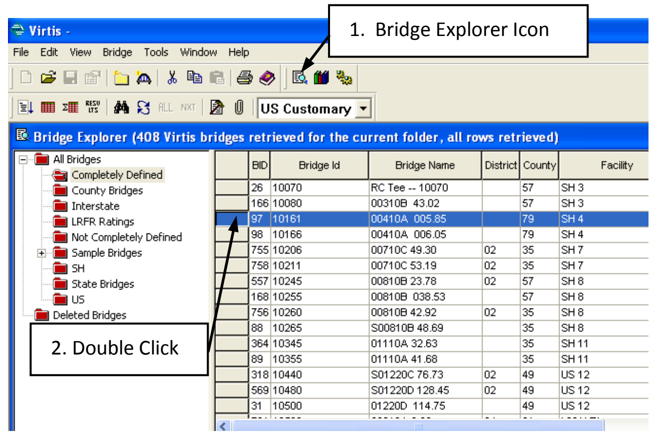
The imported vehicles will now be located in the Agency folder.



## SETTING UP AN ANALYSIS TEMPLATE IN VIRTIS™

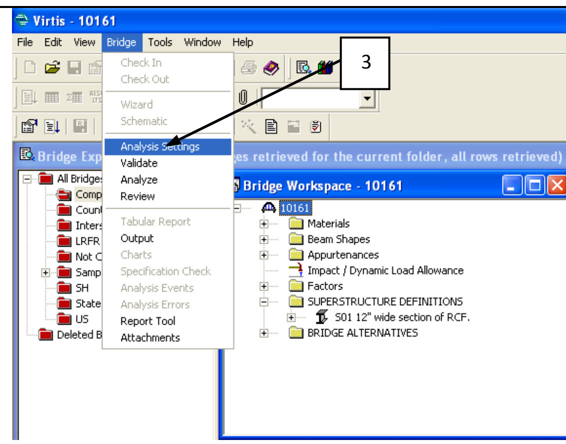
---

1. Click on the *Bridge Explorer Icon* on the tool bar at the top of the screen.
2. Open any bridge in the *Bridge Explorer* window by double clicking on the row it appears in.



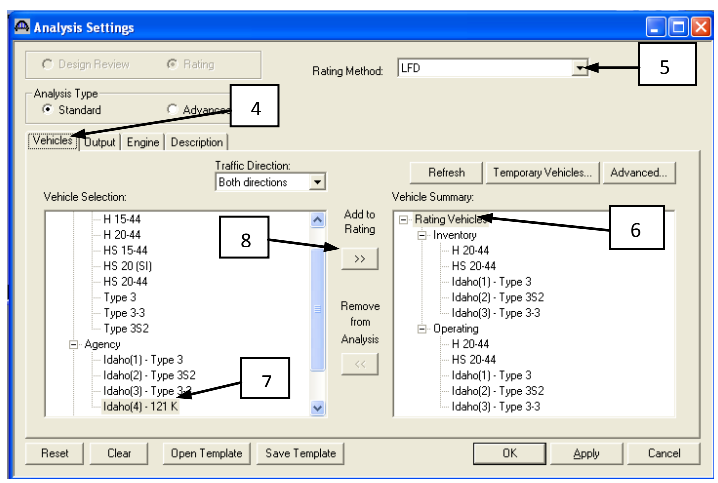

---

3. Select *Bridge* ➔ *Analysis Settings* from the top menu row.



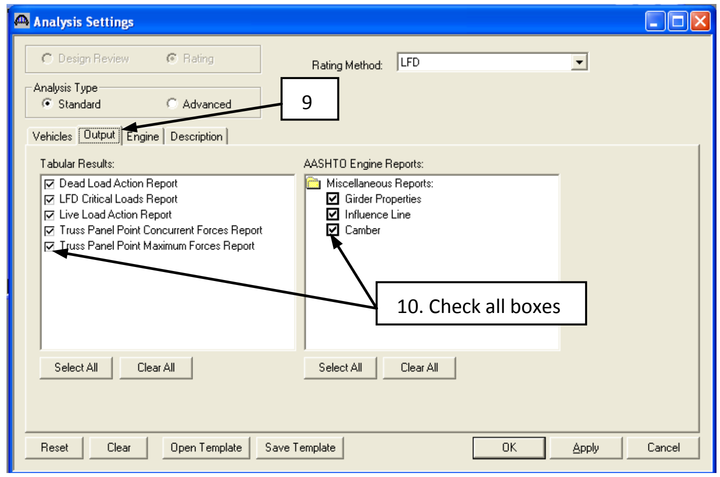

---

4. Select the *Vehicles* tab.
5. Select a rating method in the *Rating Menu* drop down menu. This example is for LFD, but that same steps can be used for LRFR and AS.
6. Click on the works *Rating Vehicles* to highlight it in the *Vehicle Summary* window. This will allow the vehicles that will be selected to be added to both the *Inventory* and *Operating* lists at the same time.
7. Select a vehicle to move to the *Vehicle Summary*.
8. Select the Add to Rating ">>" button. The selected vehicle will now be part of the *Inventory* and *Operating* lists.



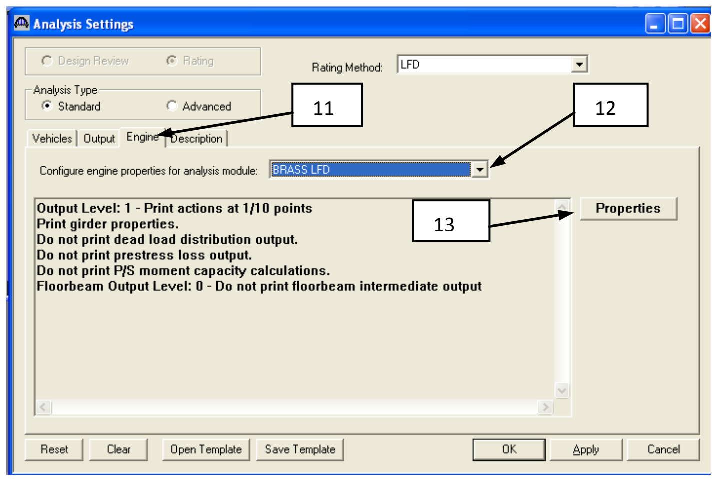

---

9. Select the *Output* tab in the *Analysis Setting* window.
10. Select to generate all available output.



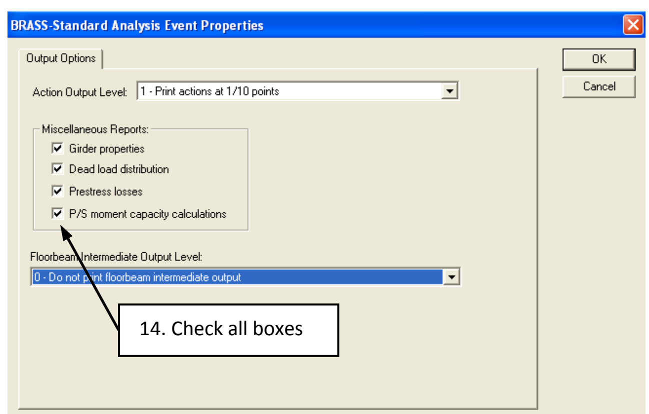

---

11. Select the *Engine* tab in the *Analysis Settings* window.
12. Select the engine desired from the pull down menu.
13. Select the *Properties* button.




---

14. Select to print all available output and calculations for girder properties, dead load distribution, prestress losses, and P/S moment calculations.

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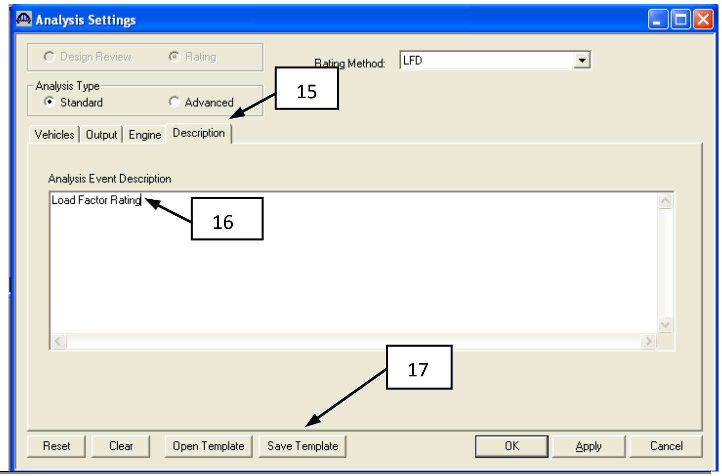
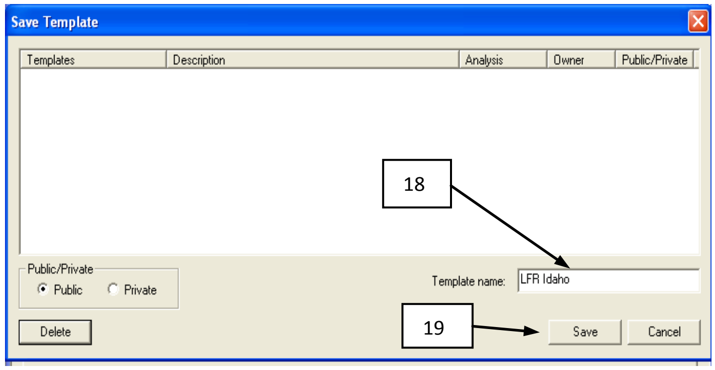
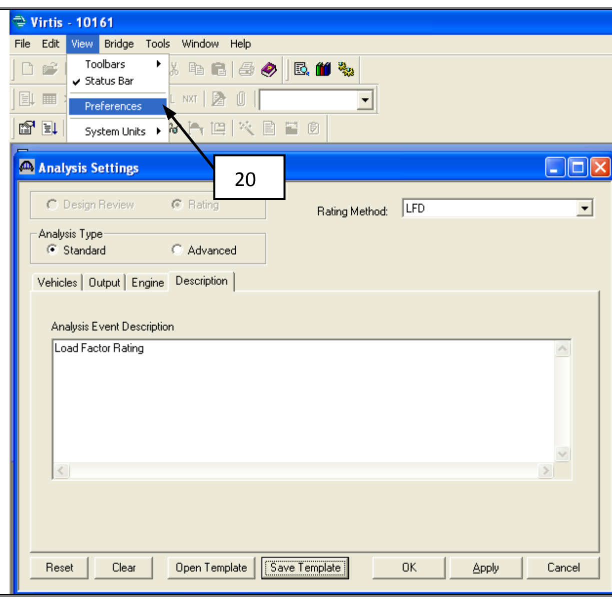
15. Select the *Description* tab in the *Analysis Settings* window.
16. The information typed in the *Analysis Event Description* will be output in the *Analysis Event Summary* window when the bridge is rated.
17. Select the *Save Template* button toward the bottom of the *Analysis Setting* window.




18. Type a name for the template in the *Template Name* field.
19. Select the *Save* button.

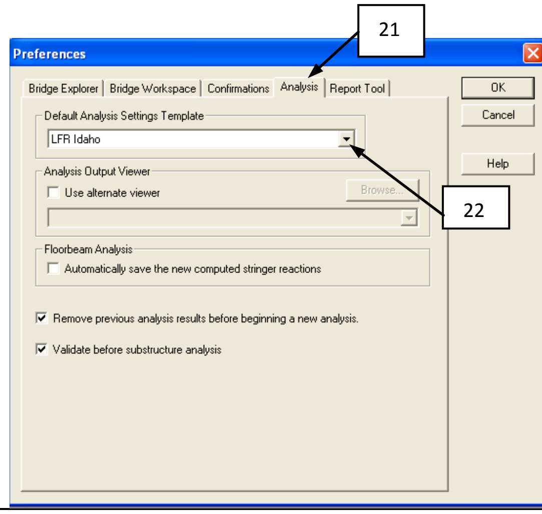



20. Select *View* ➔ *Preference* from the top menu row.



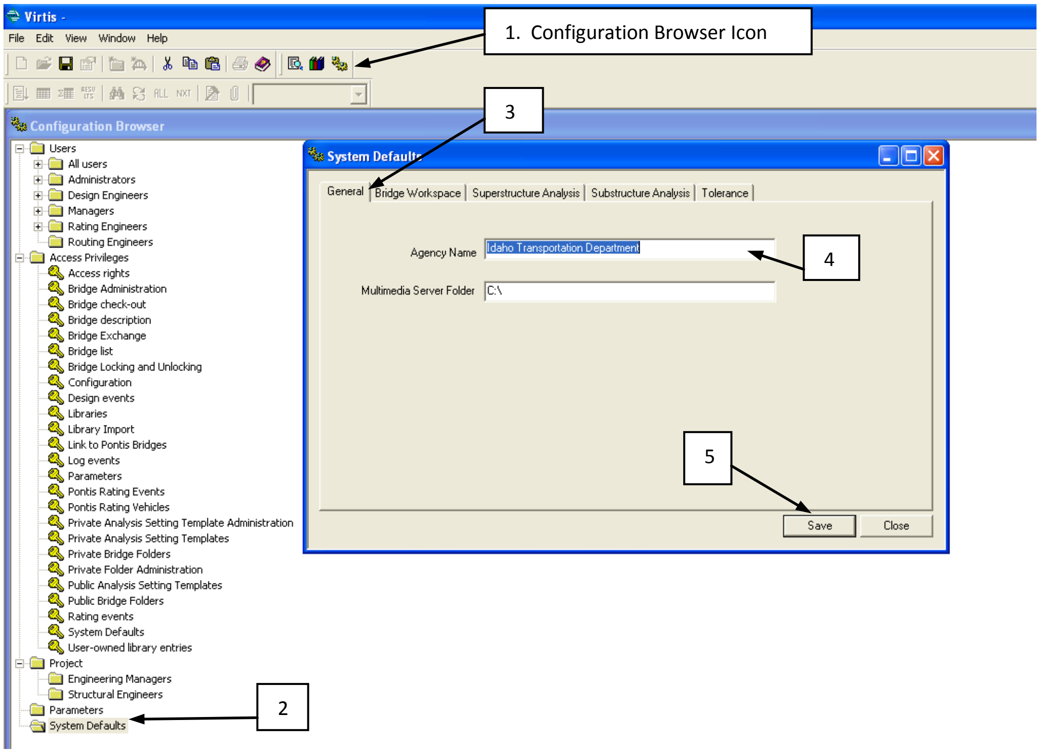
21. Select the *Analysis* tab in the *Preferences* window.
22. Select the template that has been created above using the drop down menu under *Default Analysis Setting Template*.

The default template will now load with each bridge that is to be rated.



**SETTING UP THE SYSTEM DEFAULTS IN VIRTIS™**

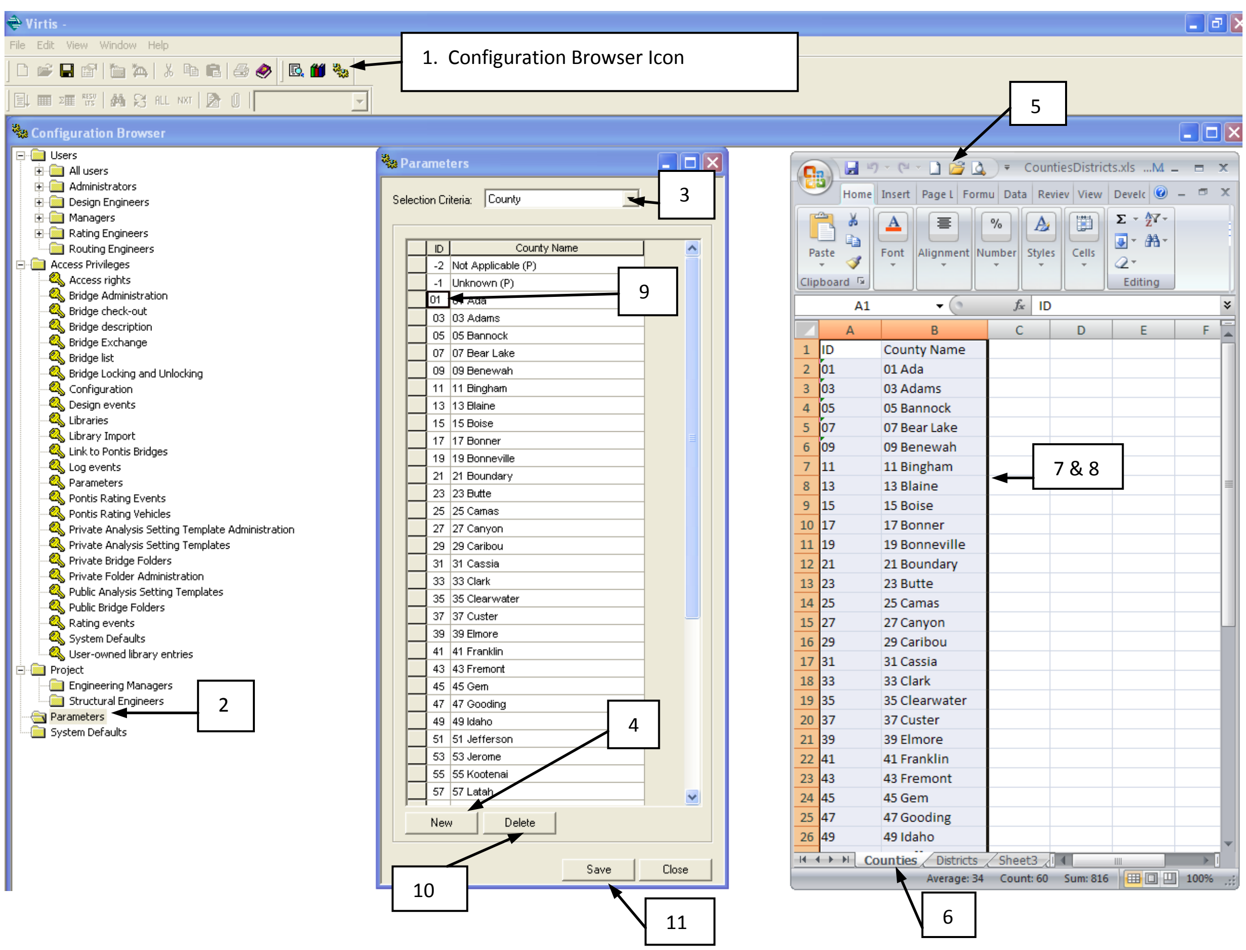
1. Select the *Configuration Browser Icon* from the tool bar at the top of the screen.
2. Select *System Defaults* at the bottom of the *Configuration Browser* tree.
3. Select the *General* tab in the *System Defaults* window.
4. Type *Idaho Transportation Department* in the *Agency* Name fields.
5. Select the *Save* button.



## CREATING PULL DOWN MENUS FOR ITD DISTRICTS AND COUNTIES IN VIRTIS™

1. Click on the *Configuration Browser Icon* on the tool bar at the top of the screen.
2. Select *Parameters* at the bottom of the *Configuration Browser* Tree.
3. Select *County* from the pull down menu.
4. Click *New* to add a blank record. A warning will pop up after each new record is created. Just hit *Enter* or click on OK and keep adding blank records until you have 44 blank rows. It is OK to create more than 44 blank records, but not less.
5. Open the Excel file provided by the ITD Load Rating Engineer titled *CountiesDistricts*.
6. Click on the *County* tab at the bottom of the screen.
7. Highlight the ID and County Name columns is the excel file.
8. Hit CTRL + C to copy the highlighted information.
9. Click in the first column of the first empty record on the County Parameters screen and hit CTRL + V to paste the Counties into Virtis.
10. Delete any extra blank records you may have created by placing your cursor anywhere in the blank row and selecting the *Delete* button.
11. Select the *Save* button.

Repeat this process for the ITD Districts.



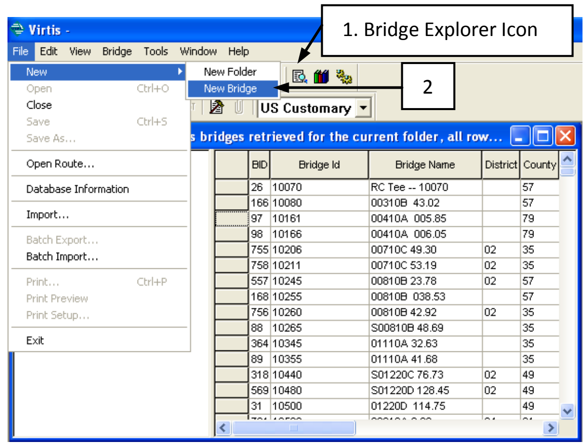
# CREATING A NEW BRIDGE IN *VIRTIS™

## CREATING A NEW BRIDGE

*Note: All instructions and screenshots were made using Virtis™ version 6.3 or earlier.

---

1. Click on the *Bridge Explorer Icon* on the tool bar at the top of the screen.
2. Select *File* ➔ *New* ➔ *New Bridge* from the top menu row.

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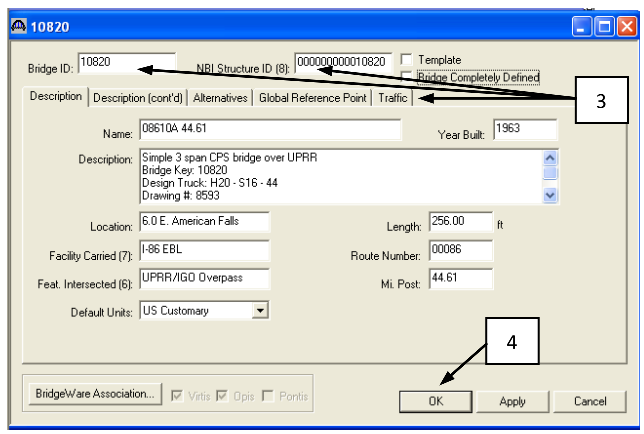
3. Fill the information on the *Bridge ID* field, *NBI Structure ID* field, *Description* tab, *Description (cont'd)* tab, *Global Reference* tab, and *Traffic* tab per the instructions in *Appendix 6.3.3* Virtis Description Data.
4. Select the *OK* button.

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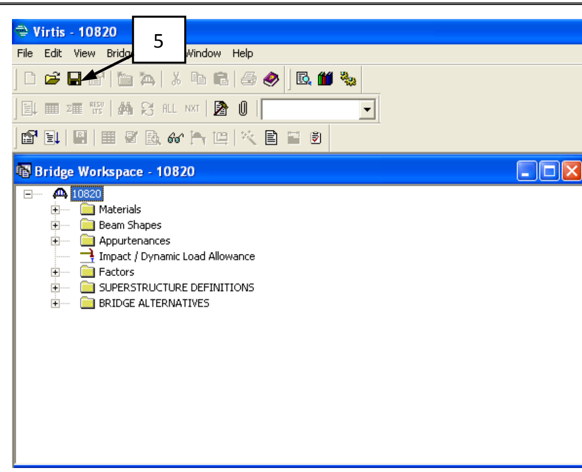
5. You will now see a bridge workspace tree, ready for data input. Click on the *Save Icon* on the tool bar at the top of the screen.

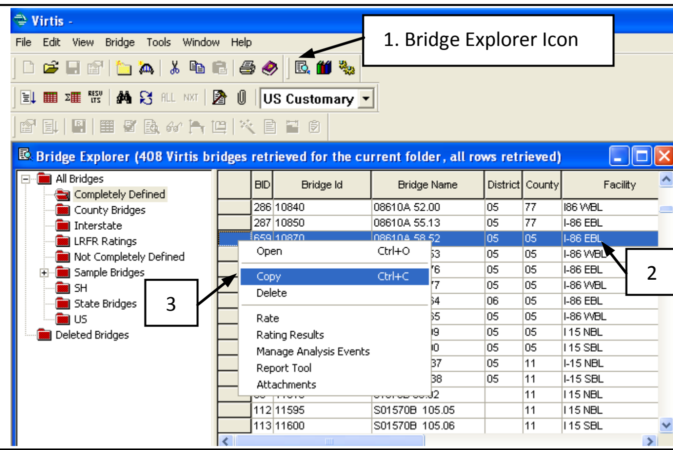



You have now created a bridge from scratch and have saved it to your database. You may complete your data input now, or exit (click on the red *X* button in the top right corner of the window) and return in the future to complete your input.

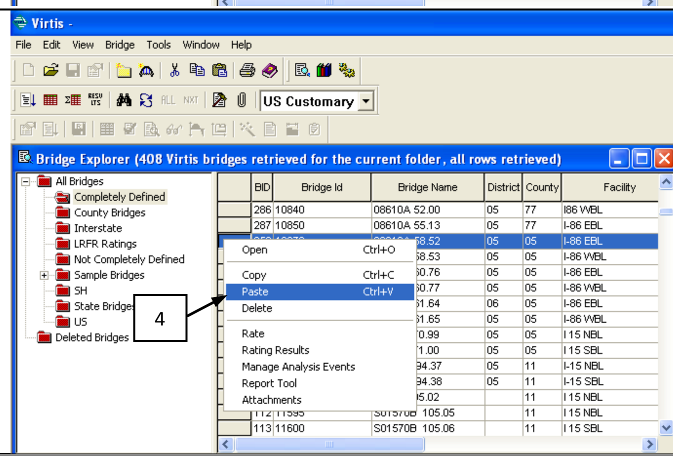
---

## CREATING A NEW BRIDGE FROM A COPY OF AN EXISTING BRIDGE

1. Click on the *Bridge Explorer Icon* on the toll bar at the top of the screen.
2. Highlight the bridge you would like to copy.
3. Right click on the mouse and select *Copy*.

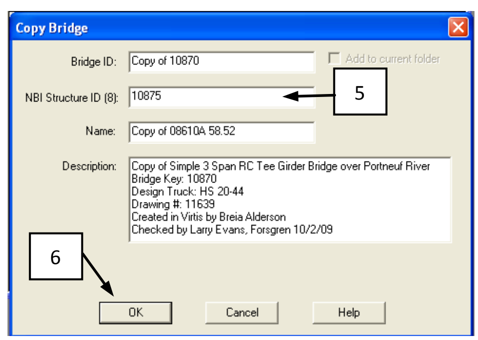



4. Right click on the mouse and select *Paste*.




5. Modify the *NBI Structure ID* for the new bridge.
6. Select the *OK* button.

The copy has been saved and will now appear in Bridge Explorer and can be modified.

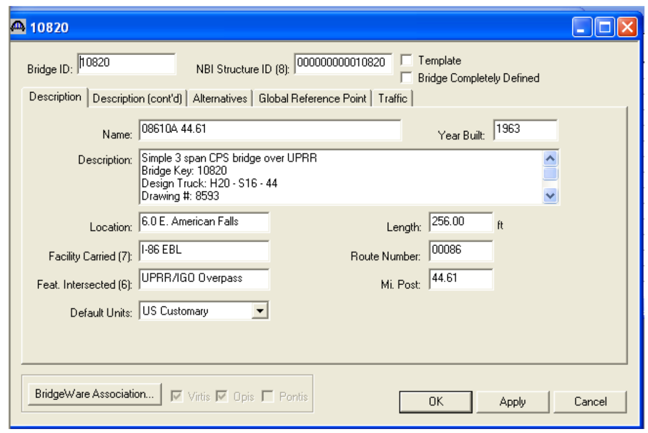


# *VIRTIS™ DESCRIPTION DATA

*Note: All instructions and screenshots were made using Virtis™ version 6.3 or earlier.

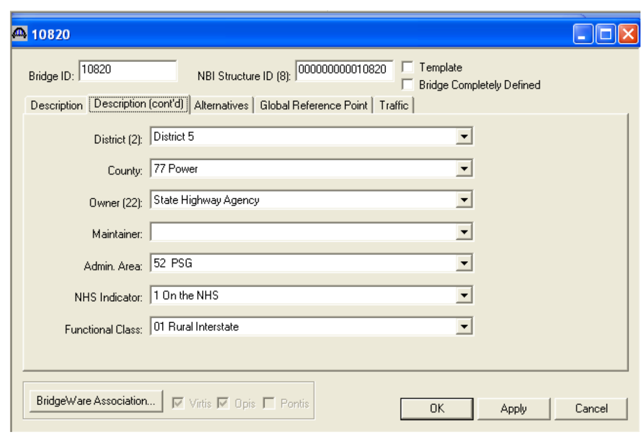
The following guidance is what ITD requires for Virtis™ load ratings. The Structure Inventory and Appraisal (SI&A) Summary will be required to fill in all the required information. This can be obtained by contacting the ITD Load Rating Engineer. If the rating is for a structure that has not yet been built, the SI&A will not exist. In this case, the load rater can fill in the information they do know, making a note on the Load Rating Summary form that the missing information is to be filled in when the structure is inventoried by the ITD Bridge Inspector.

- Bridge ID: Enter the *Bridge Key* for the structure.
- NBI Structure ID (8): Enter the *Bridge Key* for the structure with as many leading zeros as the field will allow.
- Bridge Completely Defined: Do not check this box. This is to be filled in by the ITD Load Rating Engineer.
- Name: Enter the *Structure Name* from the *SI&A*.
- Location, Facility Carried, Feature Intersected, Year Built, Length, and Mile Post: Enter data from the *SI&A*.
- Route Number (5): Input digits 4-8 of the 9 digit Inventory Route number found on the *SI&A*.
- Description: Enter the following 5 pieces of information in the field:
  - ✓ A one sentence description of the bridge. Include if the structure is simple or continuous, the number of spans, the type of bridge structure (see pg 3 of 4 for structure type abbreviations), and the feature it spans. For example: Simple 1 Span RC Tee Girder Bridge over "C" Canal.
  - ✓ Bridge Key: Enter *Bridge Key* number.
  - ✓ Design Truck: Enter the design truck listed on the plans.
  - ✓ Drawing #: List the drawing number.
  - ✓ Created in Virtis by [your name] (date of analysis)
  - ✓ Checked by [your name] (date of check)

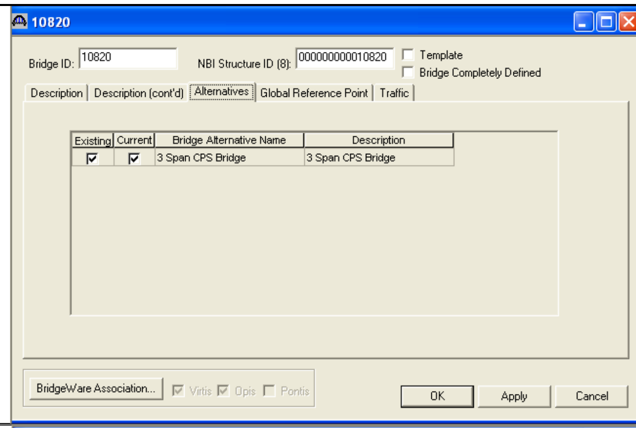



- District (2): Enter data from *SI&A* field (2) under "Identification".
- County: Enter data from *SI&A* field (3) under "Identification."
- Owner (22): Enter data from *SI&A* field (22) under "Classification."
- Maintainer: Leave blank.
- Admin Area: Leave blank. This is to be filled in by the ITD Load Rating Engineer.
- NHS Indicator: Enter data from *SI&A* field (104) under "Classification."
- Functional Class: Enter data from *SI&A* field (26) under "Classification."

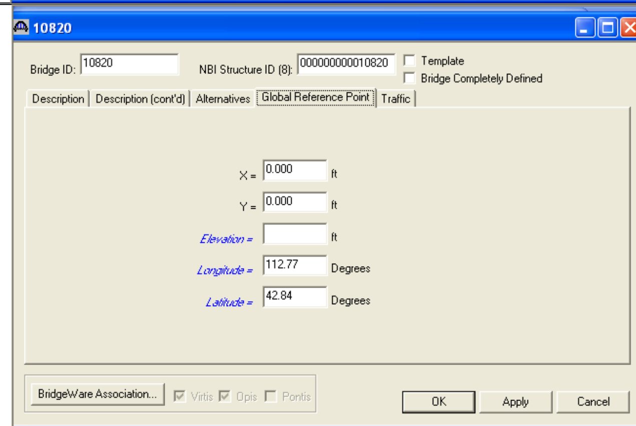
Note: District and County menus will need to be created by the user. Please refer to *Appendix 6.3.1 Virtis™ Setup* for instructions on how to create menus.



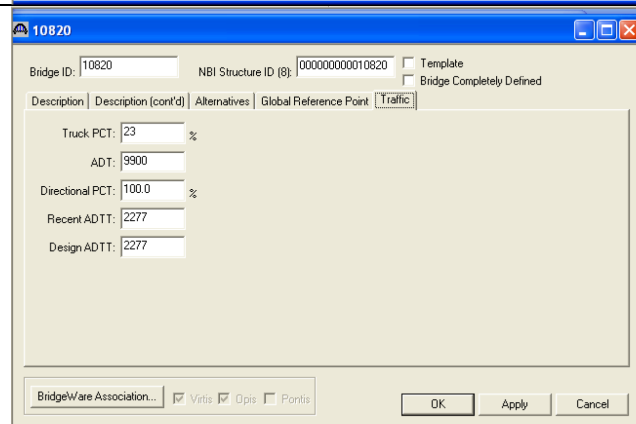
There will be nothing on this tab until a bridge alternative is created, further down the tree. Once a bridge alternative is created this tab will automatically populate. The rater does not need to do anything with this tab.



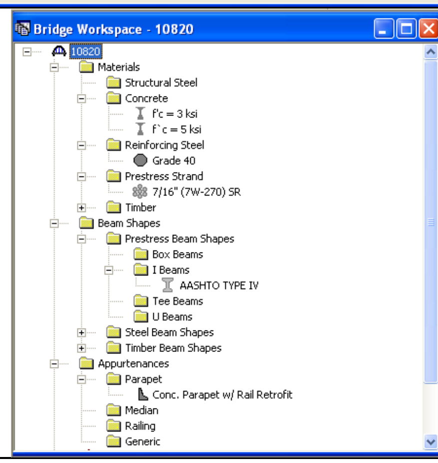

- X = : Leave at default (0.00)
- Y = : Leave at default (0.00)
- Elevation: Leave blank
- Longitude (17): Input value from *SI&A* in degrees.
- Latitude (16): Input value from *SI&A* in degrees.



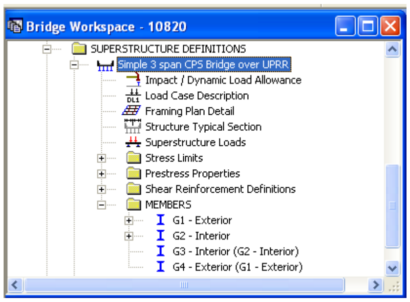

- Truck PCT: Enter data from *SI&A* Update field (109) under "Age and Service."
- ADT: Enter data from *SI&A* field (29) under "Age and Service."
- Directional PCT: Enter 100%
- Recent ADTT: Let Virtis calculate this value using the above data.
- Design ADTT: Use the same value as Recent ADTT



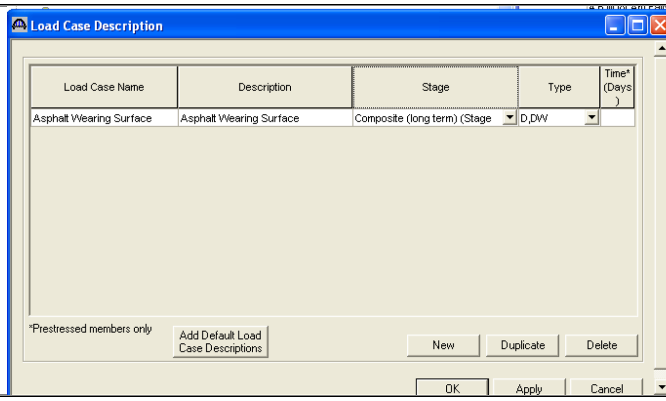

- Enter the *Name* of Materials as listed below:
  - ✓ Structural Steel: $f_y$ = X ksi
  - ✓ Concrete: "$f'_c$ = X ksi"
  - ✓ Reinforcing Steel: "Grade XX"
  - ✓ Prestressing Strand: Use standard name that is copied from the Library
- Enter the *Name* of Beam Shapes as listed below:
  - ✓ Use the name that comes standard from the Library if the shape is copied from the Library.
  - ✓ If the shape is not available to be copied from the Virtis Beam Shape Library, use the name given to the girder on the plans.
- Enter the *Name* of Appurtenances as shown. Make the name descriptive of the appurtenance.



- Double click on the words "SUPERSTRUCTURE DEFINITIONS" to create a new superstructure.
- Select *Girder System Superstructure* from the menu.
- Enter the *Name* as a short sentence which has the following information:
  - ✓ Simple or Continuous
  - ✓ Number of Spans
  - ✓ Type of Structure
    - RC = Reinforced Concrete
    - PSC = Prestressed Concrete
    - CPS = Composite Prestressed Concrete
    - SS = Structural Steel
    - CSC = Composite Steel
  - ✓ Feature Intersected
- Virtis will generate the members from the data input above in the tree.
- Add a short description behind the girder ID to identify more clearly. This description will be used in the Member Rating Results.
- Examples:
  - ✓ G1 – Exterior
  - ✓ G2 – Interior
  - ✓ G2 – Interior under Median
  - ✓ G3 – Exterior under Sidewalk

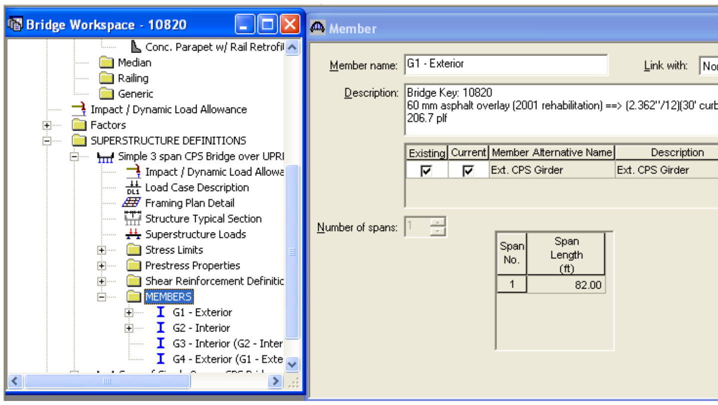



Make the load case names more descriptive than DC or DW.



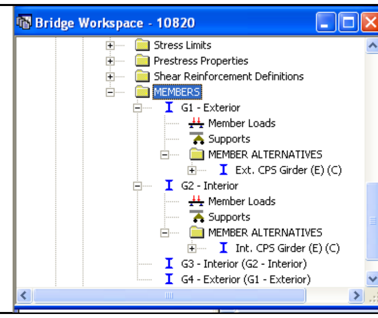

Member Description:

- Enter *Bridge Key:* followed by the key number on the first line of the description. This line will be present in the BRASS output header information.
- List important information concerning dead loads, effective width calculations, girder information, etc.
- Example for a prestressed girder:
  - ✓ Bridge Key: 16290
  - ✓ 2.5" Asphalt (1999 Report) ==> (5'3")(30 psf) = 157.5 plf
  - ✓ Parapet & Rail ==> (2.125 ft^2)(150 pcf) + 15 plf = 333.8 plf
  - ✓ Diaphragm ==> [(6' 10.5" - 6")(2'0") - (3")^2 - (6")^2](6")(0.15 kcf) = 0.9328 kips
  - ✓ Effective Width ==> L/4 = 156"; 12t = 83.25"; c-to-c = 79.5"
  - ✓ AASHTO Type II Girder w/ 18 - 1/2" stress relieved stands
  - ✓ Final Prestress Working Force per Beam = 449.4 kips

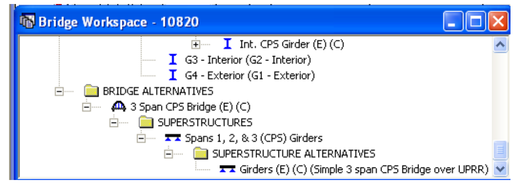


Member Alternative Description:

- Enter a more detailed description of the member.
- Include the type of girder (ie RC, CPS, PSC, SS, CSC, etc.)




- Bridge Alternative: Give a very general description of the structure.
- Superstructure: Identify the span and material. This description will be listed in the Structure Rating Results & the Member Rating Results.
- Superstructure Alternative: Give a simple name (ie girders) and link to the appropriate superstructure definition.



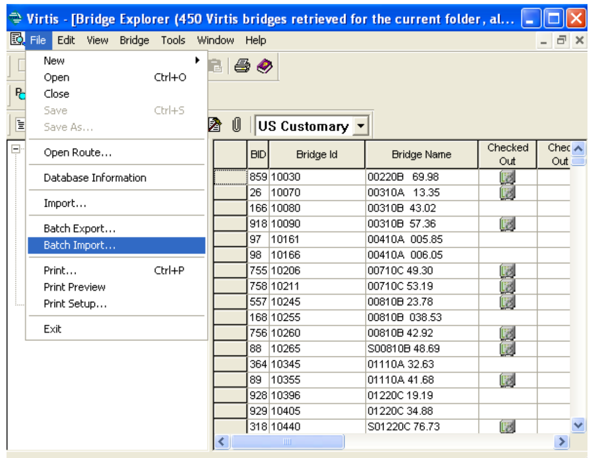
# IMPORT, EXPORT, OR DELETE A BRIDGE IN *VIRTIS™

## BATCH IMPORT

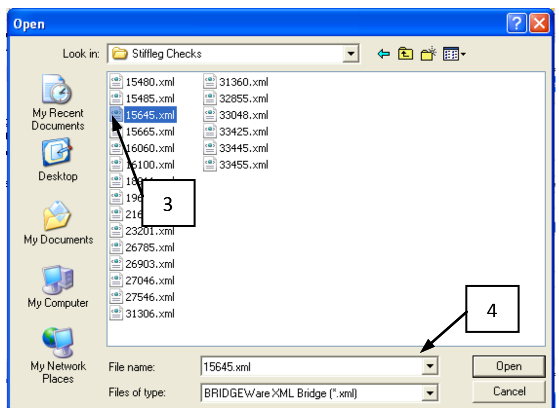
*Note: All instructions and screenshots were made using Virtis™ version 6.3 or earlier.

Batch import can be used for importing one bridge or many at the same time.

1. Click on the *Bridge Explorer Icon* on the tool bar at the top of the screen.
2. Select *File* ➔ *Batch Import*

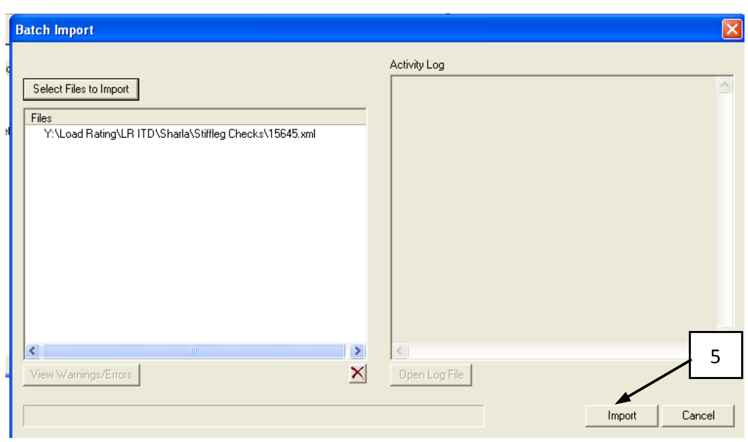



3. Browse to the location of your Virtis xml files and highlight them.
4. ➔*Open*




5. ➔*Import*

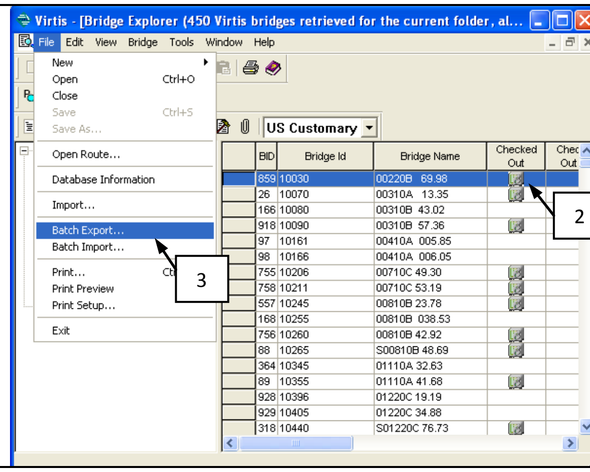
Look at the activity log to confirm the import was successful. If the import was successful, the bridge is now in the database and will show up in bridge explorer. Note: One of the most common reasons a bridge will not import is if there is already a bridge in the database with the same Bridge Id.



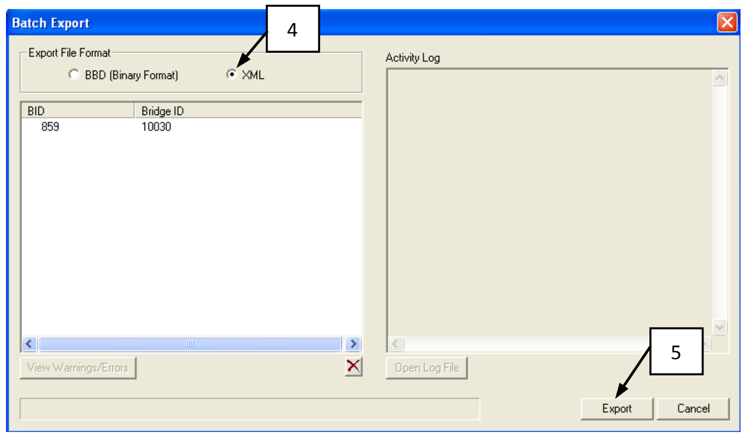
## BATCH EXPORT

Batch export can be used for exporting one bridge or many at the same time.

1. Click on the *Bridge Explorer Icon* on the tool bar at the top of the screen.
2. Highlight the bridges to be exported.
3. Select *File* ➔ *Batch Export*

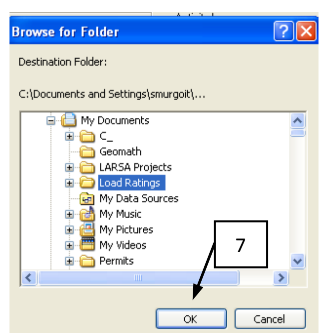



4. Make sure the Export File Format is set to XML
5. ➔*Export*




6. Browse to the location you wish to save Virtis xml files.
7. ➔*Ok*

Look at the activity log to confirm the export was successful. The file is now in xml format. It may be imported into another Virtis database, copied, or attached to an e-mail.



# ITD MODIFICATIONS TO *VIRTIS™ STANDARD SETTINGS

**CHECK SHEAR AT THE LEGAL AND PERMIT LEVEL AND CONCRETE TENSION AT THE LEGAL LEVEL FOR LRFR RATINGS**

*Note: All instructions and screenshots were made using Virtis™ version 6.3 or earlier.

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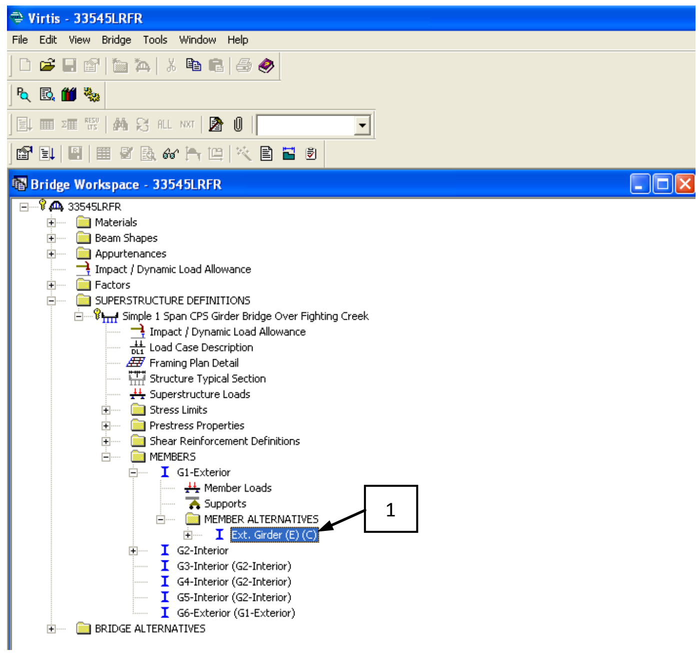
1. Double click on each member alternative defined.

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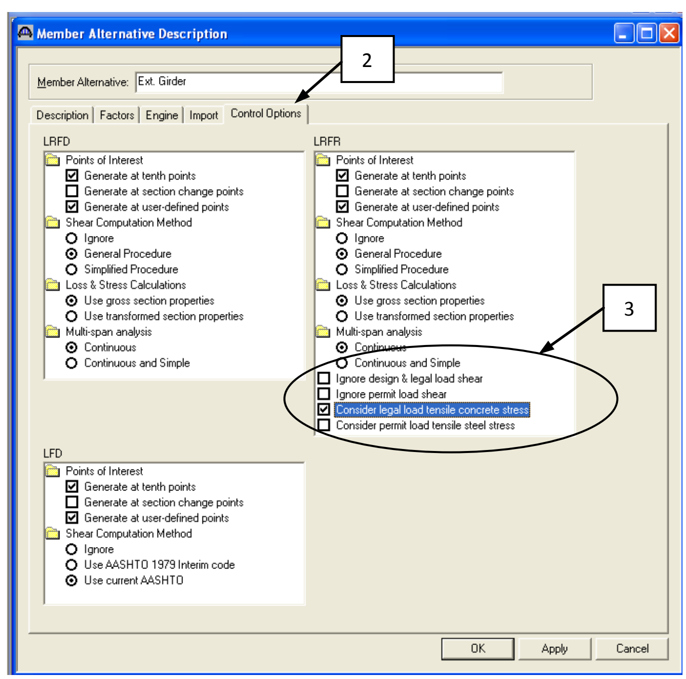
2. Select the *Control Options* tab
3. Select the LRFD Options are as shown

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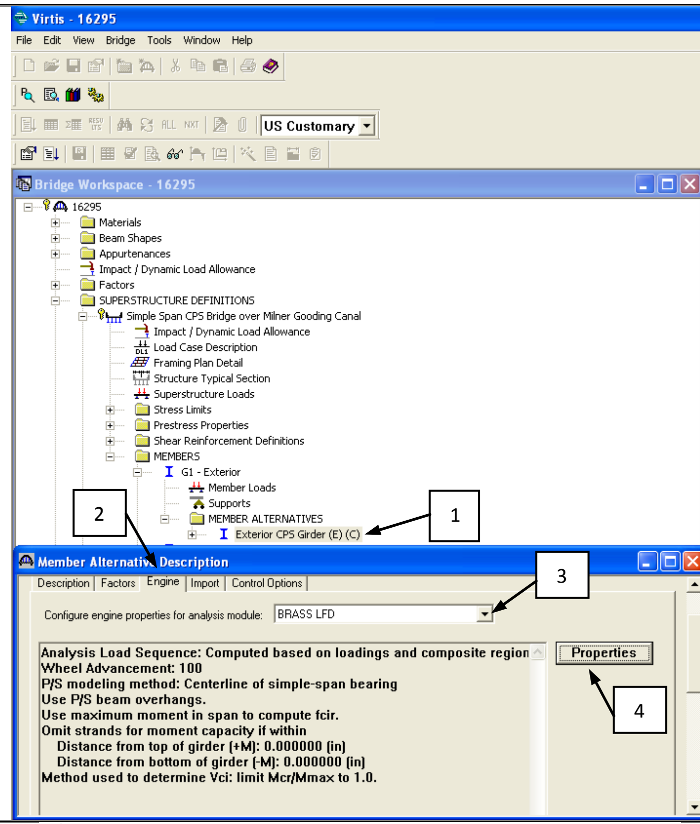
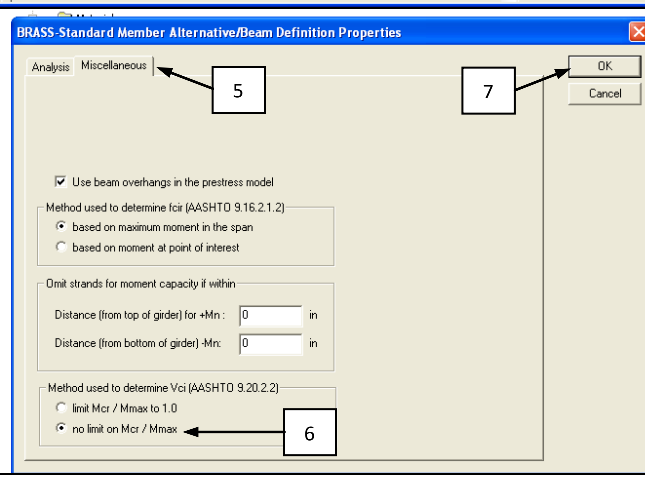
**DO NOT LIMIT $M_{CR}/M_{MAX}$ IN THE CALCULATION OF THE $V_{CI}$ TERM of EQUATION 9-27 OF THE AASHTO STD. SPEC.**

1. Double click on each member alternative defined.
2. Select the *Engine* tab
3. Select BRASS LFD from the pull down menu.
4. Right click on the *Properties* button.

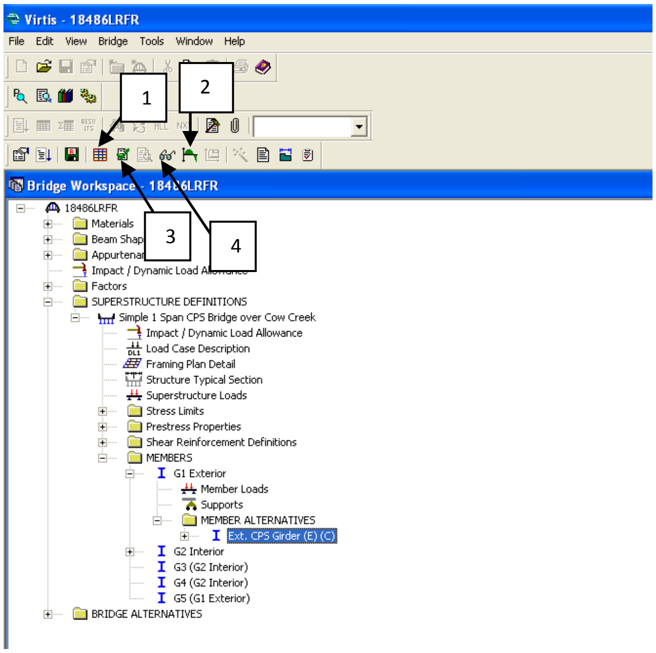



5. Select the *Miscellaneous* tab.
6. Select *no limit on* $M_{cr}/M_{max}$.
7. Right click on the *OK* button.



## ANALYZE AND VIEW *VIRTIS™RESULTS

*Note: All instructions and screenshots were made using Virtis™ version 6.3 or earlier.

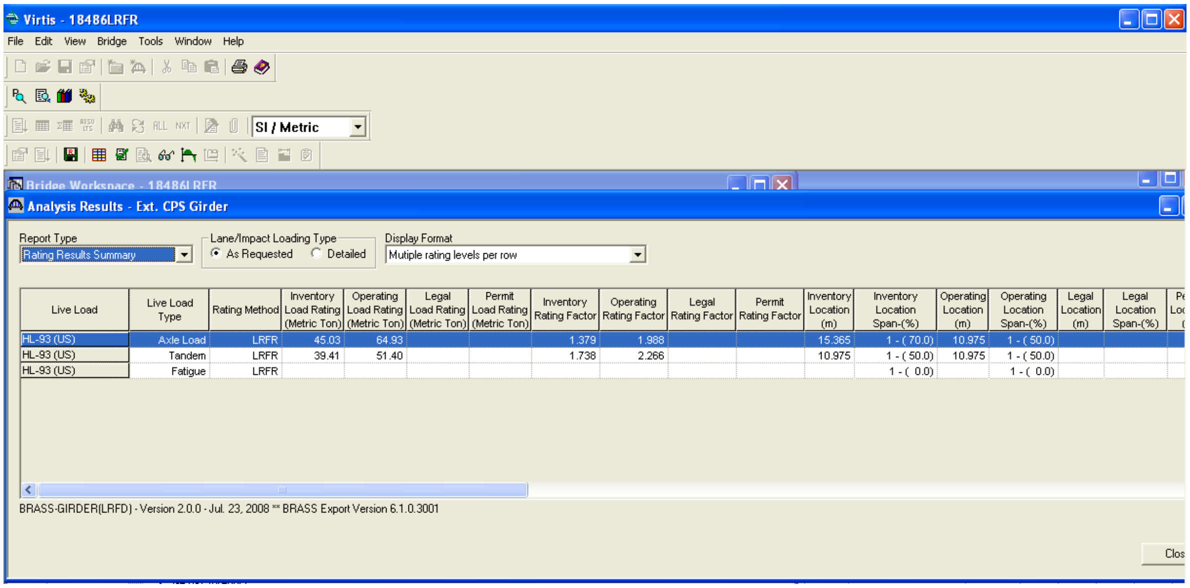



Viewing Results

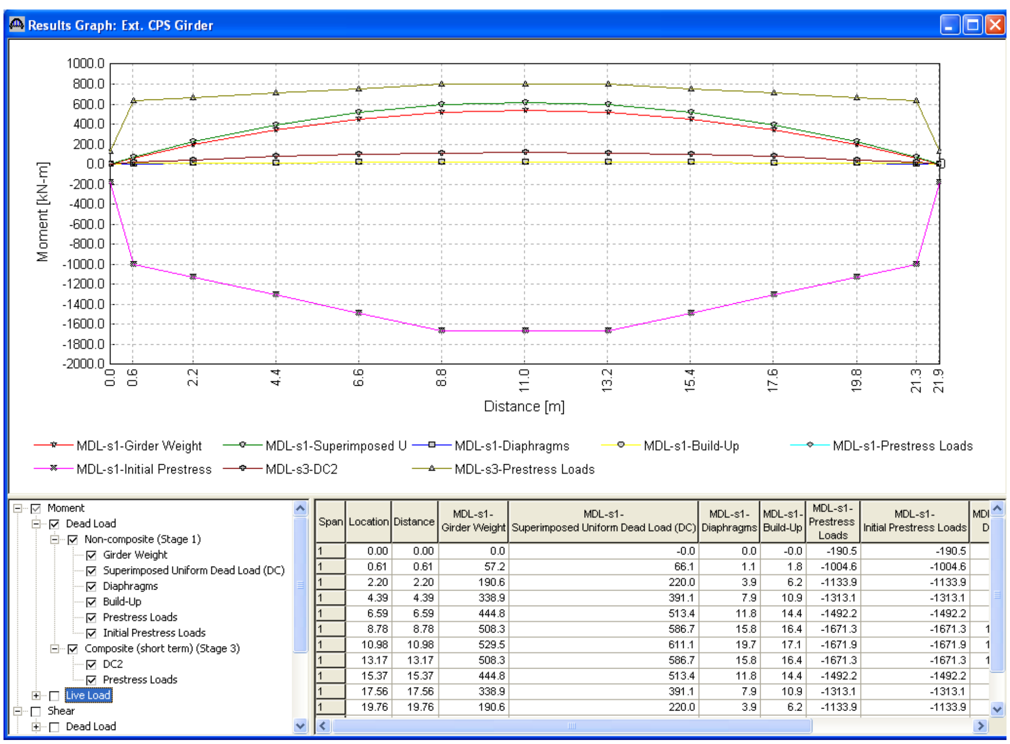
A. Run Analysis
B. Highlight member alt. with (E)(C) after its name
C. Click on the appropriate icon at the top of the screen

Icons

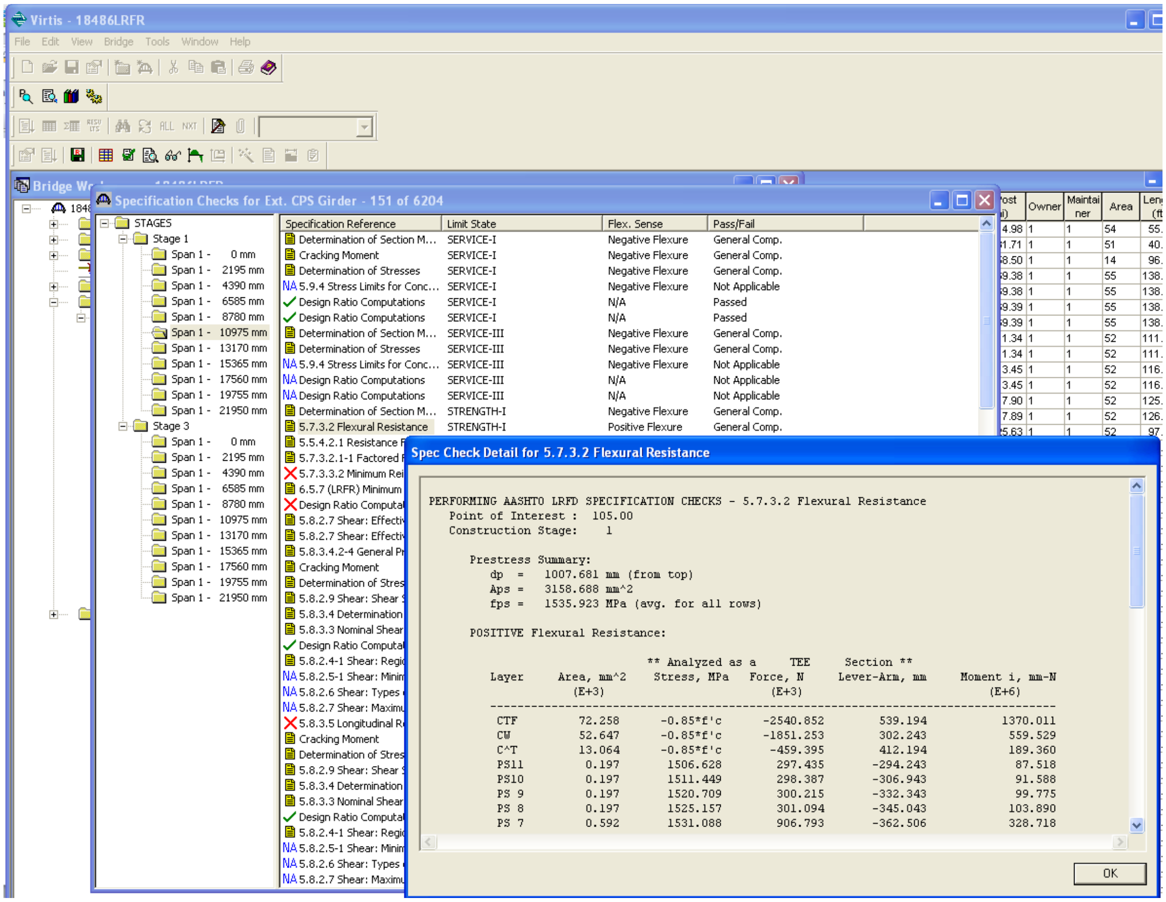
1. View Analysis Results



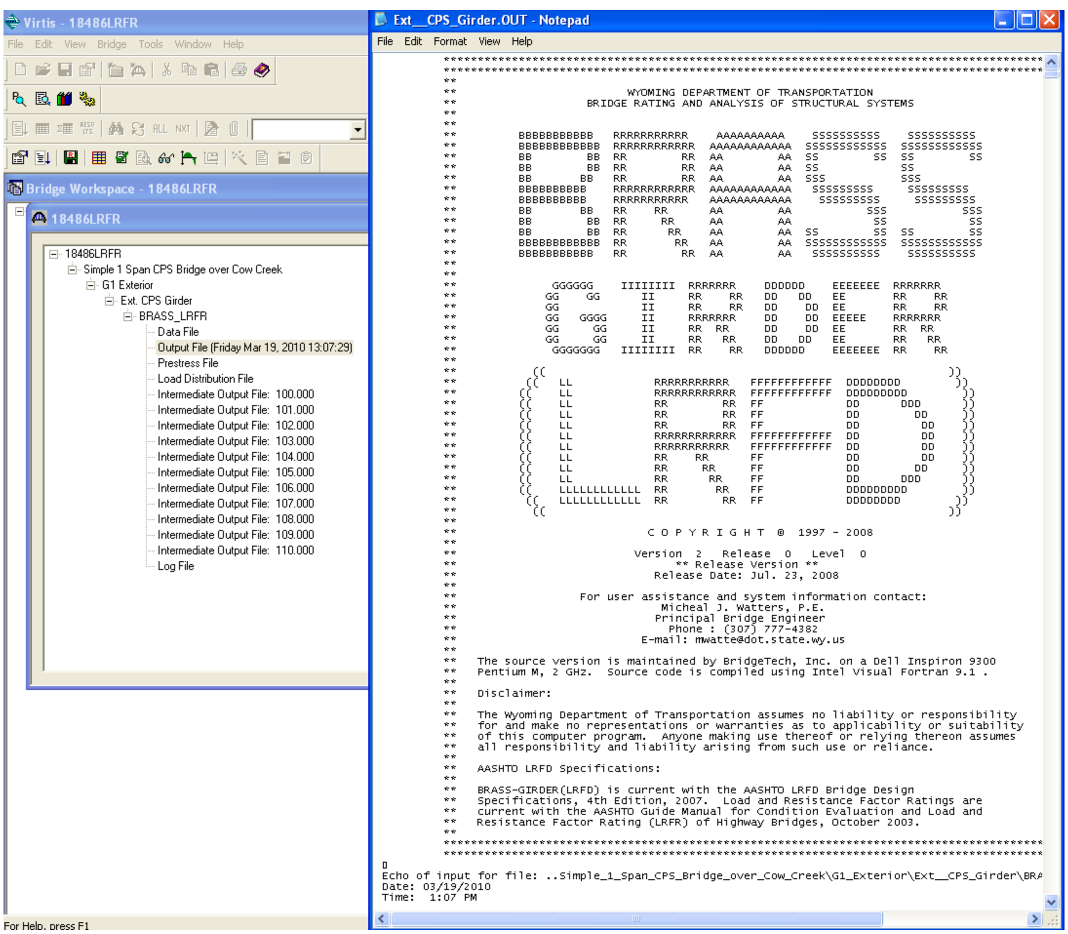

2. View Analysis Charts (Shear & Moment Diagrams - turn what you view on and off by checking the box to the left of the item)




3. View Spec Checker (can use the filter to turn on and off checks. Double click on item to open actual calculation, only available for LRFR)




4. View Analysis Output (Double click on output to get the BRASS input and output file)



# HOW TO RUN A NON-STANDARD GAGE TRUCK IN *VIRTIS™

*Note: All instructions and screenshots were made using Virtis™ version 6.3 or earlier.

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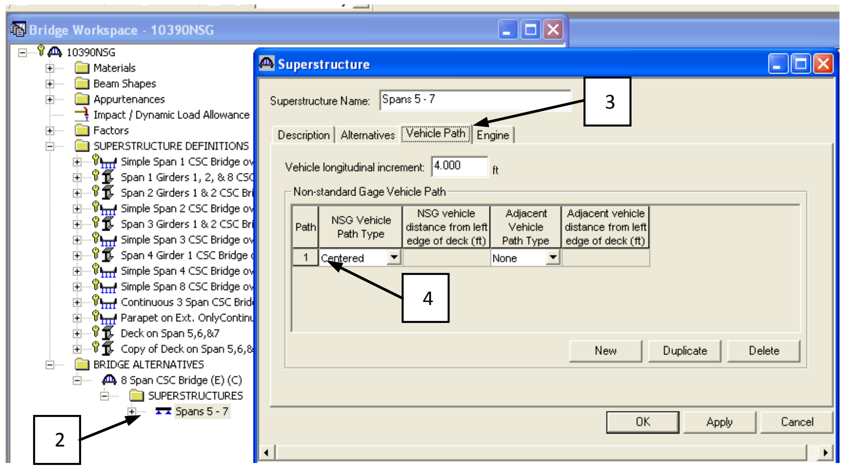
Make sure your superstructure settings are correct for the analysis you intend to do

1. Open bridge file
2. Open the Superstructure Alternatives
3. Look on the Vehicle Path Tab
4. You may put more than one path here. However, the analysis time is reduced if you only run the path you intend to use.
5. Also, make sure only superstructure system definitions are under Bridge Alternatives. NSG cannot be run on line girders.
6. Hit OK, Save file, and Close file.

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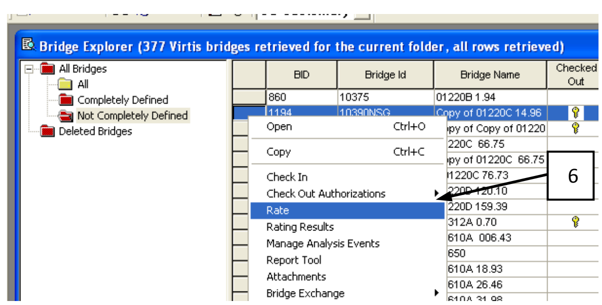
Run the Non-Standard Gage Truck Analysis

7. Highlight the bridge to be rated. Right click and select Rate.

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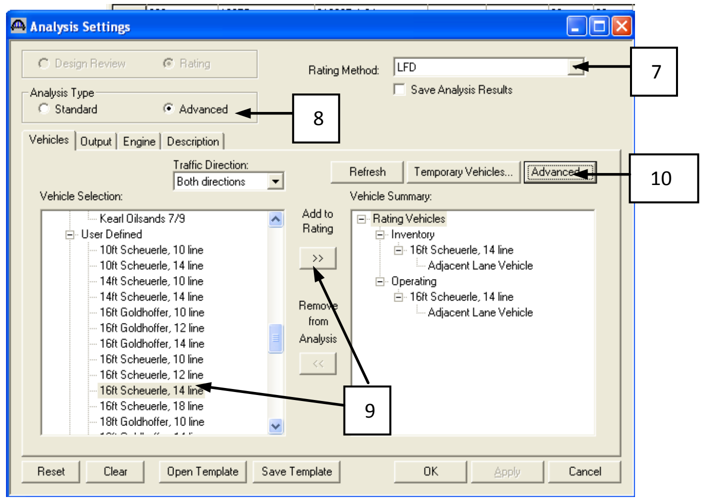
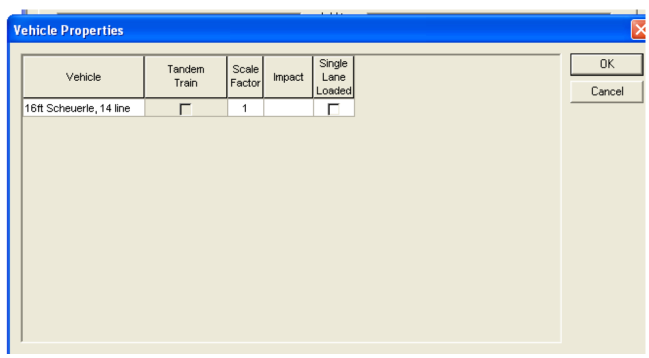
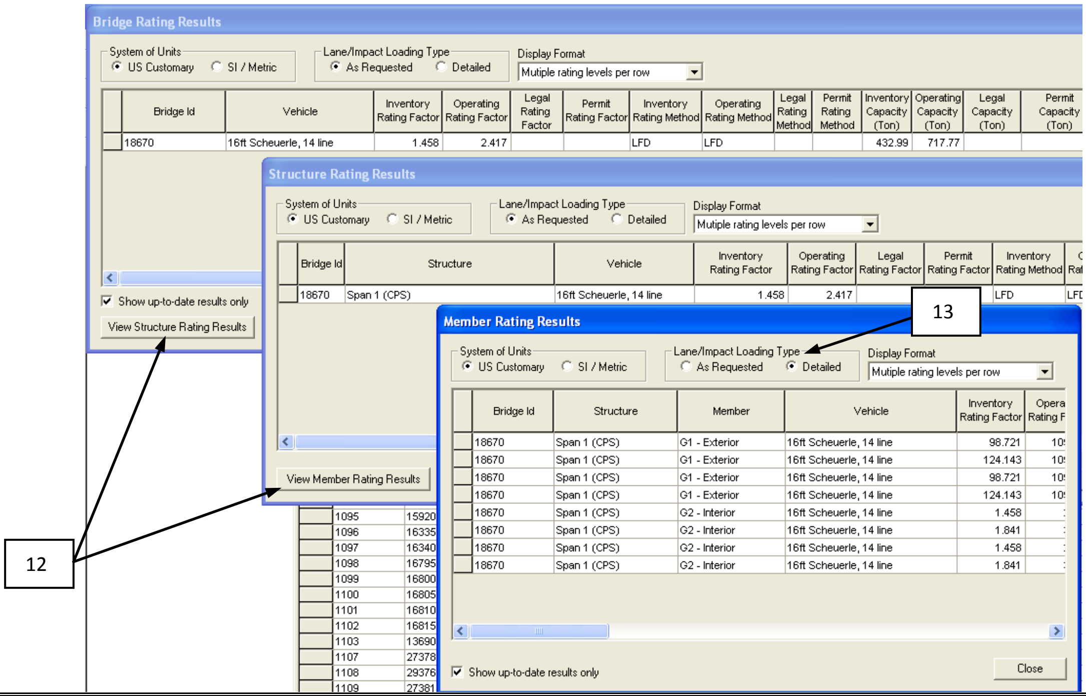
8. The Analysis Settings window will come up. Set the Rating Method to LFD. (NSG is not available for LRFD)
9. Set the Analysis Type to Advanced.
10. Select the vehicle you want to run from your Vehicle Selection list and move it to your Vehicle Summary list with the arrow buttons.
11. Set the Advanced Analysis Settings by clicking on the Advanced button.



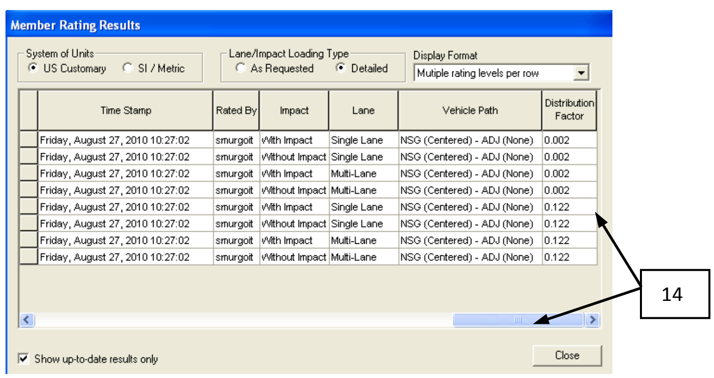

12. When the advanced settings are correct click OK and then OK again to begin the NSG analysis. It may take several minutes depending on the complexity of the bridge and the truck.



13. Hit View Structure Rating Results button twice.
14. Mate sure Lane/Impact Loading is set to Detailed

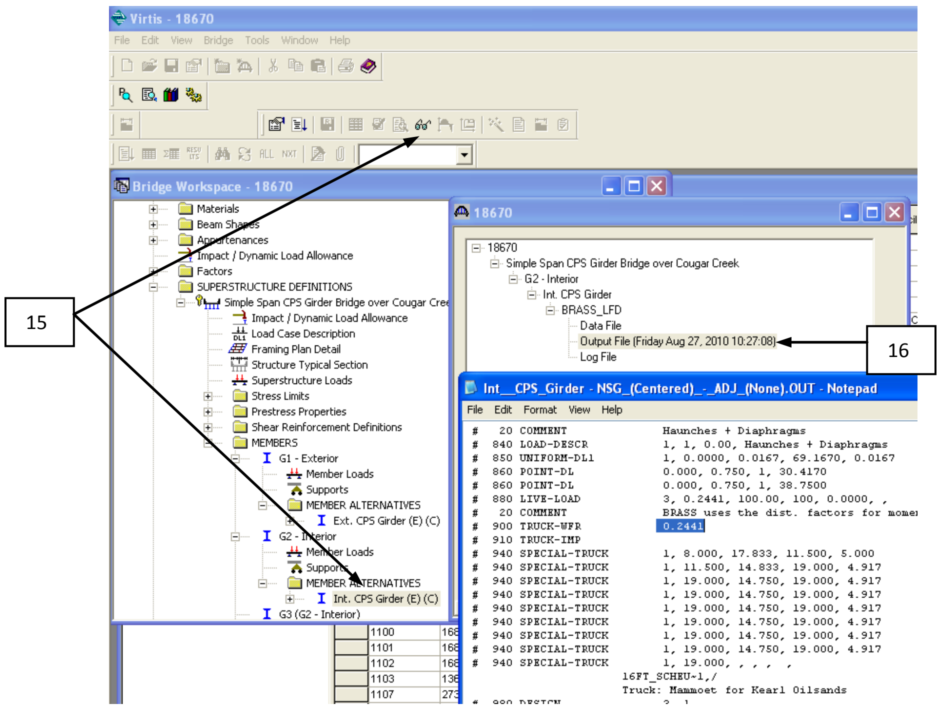


15. Scroll to the right and you will be able to view the Live Load LANE Distribution Factor used in the analysis. Please note that the Live Load Distribution factor in the BRASS input file is twice what you see here because that is a WHEEL distribution factor.



For more detailed output the bridge must be opened.

16. Select the Member Alternative and click on the Glasses Icon
17. Double click on the BRASS LFD Output File



## Checklist for In-House Rehab Ratings that have an existing BrR™ file

Rater

- ☐ Make a copy of the "Completely Defined" BrR™ file that needs to be updated.
- ☐ Change the file from "Completely Defined" to "Not Completely Defined".
- ☐ Make a copy of the Superstructure Definition(s) that needs to be updated and add year and rehab to the name(s). (Ex. Change "Span 1 CPS Girder Bridge" to "FY 2010 Rehab – Span 1 CPS Girder Bridge"
- ☐ Make the appropriate modifications to the copy of the Superstructure Definition.
- ☐ Make a list of the modifications made in the Description window on the Definition Tab of the Superstructure Definition window. Include the name and date of the person who made the modifications.
- ☐ Add the following sentence to the Description window on the Description tab of the Bridge Definition. "Modifications to file made by (*name)* on (*date)* for FY (*year*) rehab. See Superstructure Definition Description for details."
- ☐ Change the Superstructure(s) listed under Bridge Alternatives to the modified Superstructure Definitions.
- ☐ Copy the existing Load Rating Summary Form stored under Y:\Load Rating\LRS_Calcs and paste it into Y:\Load Rating\LR Rehabs directory under a folder that's name contains the bridge key. Copy and paste the information you added under to the Superstructure Definition into the Remarks section of the Load Rating Summary Form. (An engineering stamp is not required on an updated Load Rating Summary Form. Spreadsheet may need to be unprotected to edit.
- ☐ Put a pdf version of the rehab plans in the same directory as the Load Rating Summary Form
- ☐ Complete the appropriate cells of the RehabLoadRatingTracking sheet Y:\Load Rating\LR Rehabs\RehabLoadRatingTracking.xlsx
- ☐ Find someone to check the updated file if the updates are not limited to a deck rehab.
- ☐ When any comments the checker has are resolved, the rater shall send an e-mail to Shanon.Murgoitio@itd.idaho.gov. The Subject line of the e-mail should read "Ready for Q/C: (*bridge key*) rating updated for FY(*year*) Rehab"

Checker (only required for updates that are not limited to a deck rehab)

- ☐ The updated file shall be checked by someone who will add "Rehab revisions checked by: (*name*) (*date*)" in the Description window on the Definition Tab of the Superstructure Definition window and under the Remarks section of the Load Rating Summary Form.
- ☐ Complete the appropriate cells of the RehabLoadRatingTracking sheet Y:\Load Rating\LR Rehabs\RehabLoadRatingTracking.xlsx