

[This Document is for informational purposes only.](#)

“Standard Specifications for Road and Bridge Construction 2020 Edition V4.0” can be found at the following link:

<https://www.mdt.mt.gov/other/webdata/external/const/specifications/2020/SPEC-BOOK/2020-SPEC-BOOK-V4-0.pdf>

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101.03 DEFINITIONS

CONTRACT

The written agreement between the Department and the Contractor detailing the obligations of the parties for the performance of the prescribed work.

The contract includes the proposal; [Q&A forum](#); signed contract award form; contract bond; specifications; general and detail plans; Detailed Drawings; Notice to Proceed; Materials Manual; and all change orders, extra work orders, including authorized contract time extensions, that are required to complete the project.

MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD)

The FHWA *Manual on Uniform Traffic Control Devices* its current edition and its revisions. It includes the basic principles for the design and use of traffic control devices but recognizes that engineering judgment is essential to the proper use of traffic control devices. The manual may be supplemented by Standard ~~or Supplemental~~ Specifications, Special Provisions, and by project circumstances when approved by the Engineer (See MUTCD, Section 2A.03 Standardization of Application).

SPECIAL PROVISIONS

Modifications to the Standard ~~and Supplemental~~ Specifications applicable to an individual project.

SPECIFICATIONS

The compilation of provisions in this book, ~~the Supplemental Specifications~~, and Special Provisions for the performance of the project.

~~SUPPLEMENTAL SPECIFICATIONS~~

~~Approved additions and revisions to the standard specifications.~~

REASON: *Department no longer publishes Supplemental Specs; Add Q&A to contract.*

COMMENTS: *No comments received*

FINAL: ***No changes to the draft spec; published as shown***

DRAFT SPECIFICATIONS

105.04 COORDINATION OF CONTRACT PROVISIONS

Dimensions

1. Plan Information
2. Calculated
3. Scaled

Information

1. "Question and Answer Forum"
2. Special Provisions
3. Table of Contractor Submittals
4. Plans
- ~~5. Supplemental Specifications~~
6. Standard Specifications
7. Supplemental Detailed Drawings
8. Detailed Drawings

REASON: Department no longer publishes Supplemental Specs

COMMENTS: No comments received

FINAL: **No changes to the draft spec; published as shown**

DRAFT SPECIFICATIONS

102.11 WITHDRAWAL OF PROPOSALS

Submit withdrawal requests to ECCB before the time set for opening bid proposals. A bidder may withdraw any Proposal using EBS, in person, through an authorized agent, or by submitting the bid withdrawal form to ECCB via email (mdtcntplns@mt.gov) before any bid Proposal on that project is opened.

~~Submit withdrawal requests to the Department in writing before the time set for opening bid proposals. A bidder may withdraw any Proposal in person or through an authorized agent before any bid Proposal on that project is opened.~~

REASON: *Standard Special*

COMMENTS: *No comments received*

FINAL: **No changes to the draft spec; published as shown**

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103.06 CONTRACT BOND

Furnish an executed contract bond or bonds in a sum equal to the contract amount under Subsection 103.07. Use a form provided by the Department and executed by a surety company authorized by law to transact business in the State. The contract bond will remain in full force and effect until the Certificate of Completion is accepted by the Commission, plus any time period specified by Montana law.

The statutory time for filing claims against the contract bond is 90 calendar days from the date of the Commission acceptance. See sections 18-2-201 to 18-2-208 MCA. For claims filed against the bond, it is the duty of the surety company to independently investigate subcontractor and supplier claims.

After a claim has been made against the bond and upon formal request from the Surety, the Department is responsible for making periodic payments to the Surety until all bond claims are settled. The surety company is responsible for making the appropriate payments to the subcontractor or supplier who have filed compensable claims against the bond in accordance with 28-2-2103 MCA.

Once the surety company has confirmed all bond claims have been settled, the Department may resume making periodic payments to the Prime Contractor upon the request of the Prime Contractor.

REASON: Added language to clarify responsibilities of the Department and the surety company in the event of a bond claim.

COMMENTS: No comments received

FINAL: No changes to the draft spec; published as shown

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105.05 Cooperation By Contractor

A. Partnering. Implement partnering in accordance with the *Montana Partnering Field Guide*. Make a good faith effort to resolve disagreements by utilizing the partnering escalation/issue resolution ladder identified in the partner field guide prior to submitting a notice of claim.

- 1) **Level I Facilitation.** Costs incurred for Level I facilitation will be paid for in accordance with Subsection 109.04.1. Items included in the cost for payment are:
 - a) Facilitator; and
 - b) Meeting room and facilities.
- 2) **Level II Facilitation.** An internal partnering meeting will be facilitated between the Project Manager and the Contractor prior to the Notice to Proceed date.

REASON: *Standard Special.*

COMMENTS: *MCA members stated to ensure that field guide is maintained and up to date. MDT wishes to remove this and keep it as a special provision for the time being.*

FINAL: ***Proposed Spec will be removed from publishing.***

DRAFT SPECIFICATIONS

107.13 INSURANCE REQUIREMENTS

105.17.2 Final Acceptance

Contract time assessment will not cease until all warranty issues are corrected and the Final Acceptance form has been received and approved. The Project Manager may suspend contract time for punch-list items provided the roadway is in a safe and convenient condition. The date the form is approved is the Final Acceptance. ~~Maintain the insurance specified in Subsection 107.13 until the Final Acceptance is approved.~~

107.13.1 Insurance on All Contracts

Maintain commercial general liability insurance in full force, effective within 20 calendar days after award until Commission acceptance of the project, unless written approval is given by the CES Engineer to cancel the policy. Maintain Owner's and Contractor's Protective (OCP) liability insurance in full force, effective within 20 calendar days after award until Conditional ~~the~~ Final Acceptance (form MDT-CON-105-17-2) is ~~approved by the Department~~ granted by the Project Manager.

Obtain all policies from an insurer with an AM ~~Best~~ rating of A- or better on the date the policy is written.

The insurance requirements are a condition precedent to the contract. Failure to obtain and maintain all required insurance is considered a material breach of the contract.

Reinstate the policies listed above if a return to the project is required to complete additional work, including any contractual warranty work. Do not begin work until the policies are reinstated and submitted to the CES Bureau in Helena.

107.13.2 Insurance Involving Railroads

Maintain railroad protective liability insurance in full force until ~~the-Conditional~~ Final Acceptance (form MDT-CON-105-17-2) is approved by the Department.

107.13.3 Insurance Requirements When Utilities Are Present

When working below the ground surface, ensure a comprehensive \$2,000,000 insurance policy covering underground work and resulting damage to underground utilities is in effect.

Maintain insurance in full force until Conditional ~~the~~ Final Acceptance (form MDT-CON-105-17-2) is approved by the Department.

REASON: Clarifications

COMMENTS: No external comments; MDT clarifications on form number.

FINAL: Minor change to the draft spec (shown in yellow)

DRAFT SPECIFICATIONS

Final Acceptance

105.17.2 Final Acceptance

Contract time assessment will not cease until all warranty issues are corrected and the Final Acceptance form has been received and approved. The Project Manager may suspend contract time for punch-list items provided the roadway is in a safe and convenient condition. The date the form is approved is the Final Acceptance. ~~Maintain the insurance specified in Subsection 107.13 until the Final Acceptance is approved.~~

107.13.1 Insurance on All Contracts

Maintain commercial general liability insurance in full force, effective within 20 calendar days after award until Commission acceptance of the project, unless written approval is given by the CES Engineer to cancel the policy. Maintain Owner's and Contractor's Protective (OCP) liability insurance in full force, effective within 20 calendar days after award until ~~Conditional the~~ Final Acceptance (form MDT-CON-105-17-21E) is ~~approved by the Department~~ granted by the Project Manager.

Obtain all policies from an insurer with an AM Best rating of A- or better on the date the policy is written.

The insurance requirements are a condition precedent to the contract. Failure to obtain and maintain all required insurance is considered a material breach of the contract.

Reinstate the policies listed above if a return to the project is required to complete additional work, including any contractual warranty work. Do not begin work until the policies are reinstated and submitted to the CES Bureau in Helena.

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When working below the ground surface, ensure a comprehensive \$2,000,000 insurance policy covering underground work and resulting damage to underground utilities is in effect.

Maintain insurance in full force until ~~Conditional the~~ Final Acceptance (form MDT-CON-105-17-21E) is approved by the Department.

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107.17 CONTRACTOR'S RESPONSIBILITY FOR WORK

Rebuilding, repairing, and restoring damage to the work due to unforeseeable causes beyond the control of and without the fault or negligence of the Contractor (including, but not restricted to: acts of God ~~such as earthquake, flood, tornado, or other cataclysmic phenomenon of nature~~ or acts of the public enemy or of governmental authorities) will be paid for under Subsection 104.03. This does not excuse or allow compensation or repayment for any act or omission by the Contractor or its subcontractors, either in violation of law, regulation, ordinance, etc., or for any act or occurrence, which could have or should have been foreseen.

Expect ~~probable~~ adverse weather and stream flow conditions to occur. The cost of delay, loss, injury, or damage occurring to dikes, cofferdams, caissons, work bridges, haul bridges, or any other construction item or equipment, caused by adverse weather and stream flow conditions is the Contractor's responsibility.

REASON: *clean up*

COMMENTS: *FHWA had one comment*

FINAL: *Minor change to the draft spec (shown in yellow)*

Final Acceptance

107.17 CONTRACTOR'S RESPONSIBILITY FOR WORK

Rebuilding, repairing, and restoring damage to the work due to unforeseeable causes beyond the control of and without the fault or negligence of the Contractor (including, but not restricted to: acts of God ~~such as earthquake, flood, tornado, or other cataclysmic phenomenon of nature~~ or acts **of the a public** enemy or of governmental authorities) will be paid for under Subsection 104.03. This does not excuse or allow compensation or repayment for any act or omission by the Contractor or its subcontractors, either in violation of law, regulation, ordinance, etc., or for any act or occurrence, which could have or should have been foreseen.

Expect ~~probable~~ adverse weather and stream flow conditions to occur. The cost of delay, loss, injury, or damage occurring to dikes, cofferdams, caissons, work bridges, haul bridges, or any other construction item or equipment, caused by adverse weather and stream flow conditions is the Contractor's responsibility.

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108.01.1 SUBCONTRACTING

Do not hire or use in any manner a person or organization that performed any part of the design work for the Department unless first approved by the Department. Geotechnical firms who perform dynamic and static load testing of piles or thermal integrity testing of drilled shafts are exempt from this requirement.

REASON: *Common Q&A question which MDT allows*

COMMENTS: *FHWA comment*

FINAL: *MDT clarification*

Final Acceptance

108.01.1 SUBCONTRACTING

Do not hire or use in any manner a person or organization that performed any part of the design work for the Department unless first approved by the Department. Geotechnical firms who have performed project design work are approved to perform dynamic and static load testing of piles or thermal integrity testing of drilled shafts on the project.

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108.03.2 PROJECT SCHEDULES

~~Furnish a WN that details the work and time (working days, calendar days or completion date) to complete the contract. The initial schedule must show that the work will be completed in the time frame specified in the contract.~~

A. ASC Schedules. For projects not subject to Subsection 108.03.2(B) requirements, submit a schedule in accordance with the Table of Contractor Submittals. No other work, except obtaining permits, may begin until the schedule requirements have been met. No payments will be made on the contract until the submitted schedule is reviewed.

Submit a Written Narrative (WN) that details the work and time (working days, calendar days or completion date) to complete the contract. The initial schedule must show that the work will be completed in the time frame specified in the contract.

The Contractor may use a CPM schedule as the ASC if it meets the requirements described in Subsection 108.03.2 herein and results in no additional cost to the Department.

1. Include in the ASC:
 - a. A bar chart chronologically sequenced and to time scale showing the following:
 - 1) All work activities with a completion duration of 5 or more working days. (For this requirement, working days does not exclude the period from November 16th through April 15th.)
 - 2) Any work activity that has an impact on completion of the project.
 - b. The relationship of each work activity listed in Subsection 108.03.2(A)(1)(a) to other work activities, permits, plans, submittals, and approvals required to complete the project.
 - c. Work activity durations by working days or calendar days as appropriate. Indicate non-working periods exceeding 3 days on each activity bar.
2. Include in the WN:
 - a. The proposed work process sequence describing the relationship of the work activities listed in Subsection 108.03.2(A)(1) required to complete the contract, including shop drawing submittals, permits (including estimated maximum waiting periods for all required permits), fabrication and delivery activities.
 - b. A detailed description and the progress time of each work activity listed in Subsection 108.03.2(A)(1) measured by working day or calendar day, as appropriate.
 - c. A detailed description of the ASC, including holidays, planned work days per week, number of shifts per day, hours per shift, size of work crews and resources used.
 - d. Adjustments to activity durations and production rates to account for weather.

Submit an updated ASC and WN every month in which work is performed, one week before the end of the project's monthly estimate cycle. The ASC and WN should show current progress and all revisions or modifications that reflect

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changes in the method or manner of the work, specification changes, extra work, changes in duration, changes in shifts, work crews or resources.

Any delay in beginning or prosecuting work that is caused by the Contractor's failure to provide an ASC or WN when and as required is solely the responsibility of the Contractor and is not an excusable delay.

Prosecute the work with the resources required to complete the contract within the time shown in the Contractor's updated ASC and WN.

The Department may withhold 10% of each monthly progress estimate for failure to submit an initial or updated ASC or WN on time and in the manner required. Payment withheld for violation of the schedule requirements will be included in the next progress estimate following the Contractor's submission of the required ASC and WN. The Project Manager's review does not attest to the validity of the ASC or WN.

B. CPM Scheduling

Use Primavera P6 to develop, maintain, and provide a detailed time-scaled computer-generated CPM progress schedule. Submit all schedules as both an .xer file and usable .PDF format. ~~using the critical path method with Primavera P6 in a .xer file.~~

Submit a schedule in accordance with the Table of Contractor Submittals. No other work, except obtaining permits, may begin until the schedule requirements have been met. No payments will be made on the contract until the submitted schedule is reviewed.

Schedule all contract work including that of subcontractors, vendors and suppliers. The ~~baseline initial~~ schedule must show the contractor's schedule as proposed at time of award. as bid schedule for the project with a ~~All that the work will be~~ must be completed with in the time frame specified in the contract.

The Project Manager may withhold 10% of each monthly progress estimate for failure to submit an original or updated CPM schedule on time and in the manner required. Payment withheld for violation of the schedule requirements will be included in the next progress estimate following the Contractor's submission of the required CPM schedule. The Project Manager's acceptance of the CPM schedule does not attest to the validity of the Contractor's assumptions, logic constraints, dependency relationships, resource allocations, labor and equipment or other schedule aspects.

- 1. Preparation and Submission of Baseline Schedule.** ~~Prepare an initial schedule using Primavera P6 and submit an electronic file in a .xer format. Once an accepted baseline schedule is submitted, furnish one ANSI D (24-inch by 36-inch) paper copy.~~ Submit all items listed in Subsection 108.03.2(B) ~~(3)~~.

Attend a meeting scheduled by the Project Manager within 10 calendar days of the Project Manager's receipt of the baseline CPM schedule to discuss, review, correct, or adjust the CPM schedule if required. Make all schedule adjustments and corrections discussed at the meeting and resubmit a revised schedule within 15 calendar days after the meeting.

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~~Make all schedule adjustments and corrections discussed at the meeting and re-submit the revised schedule within 15 calendar days after the meeting. Plan and execute the work to meet project milestones and completion dates.~~

2. **Baseline**~~Initial~~ **Schedule Requirements.** Include the requirements listed in Subsection 108.03.2(B)(3). Include a baseline Written Narrative (WN) which and describes the following:
- Early start sort. Anticipated work in an orderly sequence of the construction phasing.
 - Description of activity relationships along the critical path.
 - Description of activity relationships for activities with float under 3 days.
 - Anticipated problems and/or risk that may impact the schedule.
 - The anticipated project completion date.
 - Anticipated contractual phase or milestone completion dates.
 - Anticipated contractor/subcontractor activity manpower, equipment, unit quantities and production rates

Narratives that are a listing of the work will not be accepted.

- ~~a. 60-day look ahead bar charts by early start; and~~
 - ~~b. Logic diagram having a maximum 100 activities for each ANSI D (24-inch by 36-inch) size sheet. Ensure each sheet includes project number, page number, title, match data or diagram correlation and key to identify all components used in the diagram.~~
3. **Schedule Requirements.** Submit CPM schedules that include:
- ~~a. All critical and contractual activities, and all other activities over 5 days.~~
 - ~~a. Activity identification numbers.~~
 - ~~b. All contractual~~Project phases and milestones.
 - ~~c. Activities must reflect the party performing each activity. Only one party may perform each activity. Include and describe all subcontractors/suppliers and the area/location of each activity.~~
 - ~~b.~~
 - ~~c. Activity descriptions:~~
 - ~~Appropriate relationships.~~
 - ~~d. Appropriate activity relationships containing only contractual constraints in the schedule logic.~~
 - ~~d.e.~~ Activity durations of no more than 30 days.
 - ~~e.f.~~ Procurement of permits.
 - ~~f.g.~~ Material procurement separated into at least two activities: (1), fabrication, and (2) delivery. Include time for delivering all submittals and Department review of working drawing submittals as separate items in the schedule logic for all items requiring submittal, review and approval

~~Activities coded to reflect the party performing each activity (only one party performs each activity) including subcontractors and suppliers and the area/location of each activity.~~

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- ~~h. Include activities for delivering all submittals and Department review of working drawing submittals as separate items in the schedule logic for all items requiring submittal, review, and approval.~~
 - ~~g. Workdays per week, holidays, number of shifts per day, hours per shift and major equipment to be used.~~
 - ~~h. Phasing (staging) details if the work has phasing or is to be performed in phases.~~
 - ~~i. A WN which describes the following:~~
 - ~~● Anticipated work in an orderly sequence of the construction phasing.~~
 - ~~● Activity relationships.~~
 - ~~● Anticipated problems.~~
 - ~~● Anticipated project completion dates, in a detailed description; and~~
 - ~~● Activity manpower, equipment, unit quantities and production rates.~~

~~Narratives that are a listing of the work will not be accepted. Include written narratives with each submission.~~
 - ~~i. Enterprise Calendars adjusted to show planned or actual work days per week; ~~include~~ ing weekends, holidays, or other Contractor non-work periods. Use project specific calendars. All activities must contain an ~~be~~ identified by entry of their appropriate calendar; ~~and~~~~
 - ~~j. Adjustments to activity durations and production rates to account for weather, as needed.~~
 - ~~j. Adjustments to activity durations and production rates to account for weather.~~
- ~~Use only contractual constraints in the schedule logic.~~

Float is defined as the amount of time between when an activity “can start” and when it “must start”. Total float is float shared with all other activities and is defined as the amount of time an activity can be delayed without affecting the overall time of project completion. Float is a shared commodity, not for the exclusive use or financial benefit of either party. Either party has the full use of float until it is depleted. Schedules with negative float will not be accepted unless otherwise approved by the Project Manager.

The critical path is defined as the longest continuous sequence of activities through the network schedule that establishes the minimum overall project duration. The submitted activity sequence and durations must generate a CPM schedule having a critical path, using the longest path method. Keep multiple critical paths and near-critical paths to a minimum. Describe multiple critical paths and near-critical paths with thorough and reasonable justification in the written narrative.

~~Show the sequence and interdependence of all activities required for the complete performance of all items of work under this contract, including acquiring all the environmental permits. Show all network “dummies” on the diagram.~~

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The Department reserves the right to limit the number of activities on the schedule to between 50 and 1000 activities.

All project activity must be identifiable and the progress on each activity must be measurable by the Project Manager at all times.

~~4. Schedule Updates and Progress Payments. Schedule and attend monthly project progress meetings to compare the schedule to the actual finish dates of completed activities, the remaining duration of uncompleted activities and the proposed logic and/or time estimate revisions. Provide the status of activities at these meetings, and the schedule updates based on this information once it has been verified.~~

Each month of the project, one week before the end of the project's monthly estimate cycle, submit an electronic .xer file using Primavera P6 and a .PDF file containing:

- ~~a. Actual dates for all activities completed or progressing to the file data date. The file data date must be within 7 calendar days of the Project Manager's receipt of the schedule. Total float sort.~~
- ~~b. Updated schedule logic for actual or planned work differing from previous schedules. The data date and current date line on the bar chart.~~
- ~~c. A WNarrative report describing the following:
 - ~~• -All changes to the critical path. Discuss why the changes occurred and the overall impact to the project;~~
 - ~~• All critical logic revisions/modifications to the schedule. Include changes in the method or manner of the work, changes in specifications, extra work, changes in duration, etc.~~
 - ~~• Anticipated problems and/or risk that may impact the schedule~~
 - ~~• Changes to anticipated completion dates, milestones, or phases~~
 - ~~• Changes to anticipated contractor/subcontractor activity manpower, equipment, unit quantities and production rates~~~~

~~A. logic revisions or modifications to the schedule, including, but not limited to changes in the method or manner of the work, changes in specifications, extra work, changes in duration, etc.; and~~

- ~~c. Any revised activity on node diagrams for the following:
 - ~~1) Delay in the completion of any critical activity.~~
 - ~~2) Actual prosecution of the work that is different than that represented on the CPM schedule; and~~
 - ~~3) The addition, deletion, or revision of activities required by contract modification or logic revisions.~~~~

Ensure monthly schedule and WN updates accurately reflect the actual work progress~~previous month's actual work~~. Correct errors listed by the Project Manager within 3 business days of notification. The contract time will be adjusted only as specified in the contract. Submit~~Furnish~~ documentation to support requests for time extensions for milestone dates or the contract completion date in accordance with Section 108.07.

~~Ensure that the WN and project schedules submitted meet the above requirements and accurately reflect the work progress. If the project work is not~~

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proceeding consistently with the Contractor's most recently reviewed project schedule or WN, the Project Manager may suspend work under Subsection 105.01(A) if the WN or ~~project~~ schedule does not accurately reflect the actual progress of the work; the suspension may continue until an accurate WN and ~~project~~ schedule is submitted.

Attend monthly project progress meetings to compare the schedule to the actual finish dates of completed activities, the remaining duration of uncompleted activities and the proposed logic and/or time estimate revisions. Provide the status of activities at these meetings, and the schedule updates based on this information once it has been verified.

~~Failure to submit either a CPM or ASC schedule or schedule update to the Project Manager within 2 calendar days of its due date will result in a monthly deduction in accordance with Table 108-2.~~

**TABLE 108-2
PROJECT SCHEDULE DEDUCTIONS**

Original Contract Amount		Monthly Deduction
From More Than	To and Including	
\$ 0	\$ 1,000,000	\$ 300
\$ 1,000,000	\$ 3,000,000	\$ 700
\$ 3,000,000	=	\$ 1,000

C. CPM Scheduling Method of Measurement

CPM schedule is measured by the lump sum. Other scheduling requirements are not measured for payment.

D. CPM Scheduling Basis of Payment

Payment for all costs associated with CPM scheduling is included in the lump sum contract unit price for CPM scheduling. Payment for all costs associated with other scheduling requirements is included in the payment for other items of work.

Failure to submit a revised CPM schedule as specified may also result in withholding 10% of each monthly progress estimate. Payment withheld for violation of the schedule requirements will be included in the next progress estimate following the Contractor's submission of the required schedule.

Partial payments for CPM scheduling will be made based on the lump sum contract unit price as follows:

1. 50% when the initial schedule is finalized.
2. 75% when the overall project is 50% complete.
3. 100% when all updates have been submitted.

E. ASC or CPM Failure to Submit

Failure to submit either an CPM or ASC or CPM schedule or schedule update to the Project Manager within 2 calendar days of its due date will result in a monthly deduction in accordance with Table 108-2.

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TABLE 108-2

PROJECT SCHEDULE DEDUCTIONS

<u>Original Contract Amount</u>		<u>Monthly Deduction</u>
<u>From More Than</u>	<u>To and Including</u>	
<u>\$ 0</u>	<u>\$ 1,000,000</u>	<u>\$ 300</u>
<u>\$ 1,000,000</u>	<u>\$ 3,000,000</u>	<u>\$ 700</u>
<u>\$ 3,000,000</u>	<u>=</u>	<u>\$ 1,000</u>

REASON: *Clean-up; MDT and Contractor input*

COMMENTS: *Comments received from Contractors.*

FINAL: *Clarifications have been added due to comments. Final Acceptance on the following page.(shown in yellow)*

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Final Acceptance

108.03.2 Project Schedules

A. ASC Schedules. For projects not subject to Subsection 108.03.2(B) requirements, submit a schedule in accordance with the Table of Contractor Submittals. No other work, except obtaining permits, may begin until the schedule requirements have been met. No payments will be made on the contract until the submitted schedule is reviewed.

Submit a Written Narrative (WN) that details the work and time (working days, calendar days or completion date) to complete the contract. The initial schedule must show that the work will be completed within the time frame specified in the contract.

The Contractor may use a CPM schedule as the ASC if it meets the requirements described in Subsection 108.03.2 herein and results in no additional cost to the Department.

2. Include in the ASC:

- d. A bar chart chronologically sequenced and to time scale showing the following:
 - 3) All work activities with a completion duration of 5 or more working days. (For this requirement, working days does not exclude the period from November 16th through April 15th.)
 - 4) Any work activity that has an impact on completion of the project.
- e. The relationship of each work activity listed in Subsection 108.03.2(A)(1)(a) to other work activities, permits, plans, submittals, and approvals required to complete the project.
- f. Work activity durations by working days or calendar days as appropriate. Indicate non-working periods exceeding 3 days on each activity bar.

3. Include in the WN:

- e. The proposed work process sequence describing the relationship of the work activities listed in Subsection 108.03.2(A)(1) required to complete the contract, including shop drawing submittals, permits (including estimated maximum waiting periods for all required permits), fabrication and delivery activities.
- f. A detailed description and the progress time of each work activity listed in Subsection 108.03.2(A)(1) measured by working day or calendar day, as appropriate.
- g. A detailed description of the ASC, including holidays, planned workdays per week, number of shifts per day, hours per shift, size of work crews and resources used.
- h. Adjustments to activity durations and production rates to account for weather.

Submit an updated ASC and WN every month in which work is performed, one week before the end of the project's monthly estimate cycle. The ASC and WN should show current progress and all revisions or modifications that reflect changes in the method or manner of the work, specification changes, extra work, changes in duration, changes in shifts, work crews or resources.

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Any delay in beginning or prosecuting work that is caused by the Contractor's failure to provide an ASC or WN when and as required is solely the responsibility of the Contractor and is not an excusable delay.

Prosecute the work with the resources required to complete the contract within the time shown in the Contractor's updated ASC and WN.

The Department may withhold 10% of each monthly progress estimate for failure to submit an initial or updated ASC or WN on time and in the manner required. Payment withheld for violation of the schedule requirements will be included in the next progress estimate following the Contractor's submission of the required ASC and WN. The Project Manager's review does not attest to the validity of the ASC or WN.

B. CPM Scheduling

Use Primavera P6 to develop, maintain, and provide a detailed time-scaled computer-generated CPM schedule. Submit all schedules as both an .xer file and usable .PDF format.

Submit a schedule in accordance with the Table of Contractor Submittals. No other work, except obtaining permits, may begin until the schedule requirements have been met. No payments will be made on the contract until the submitted schedule is reviewed.

Schedule all contract work including that of subcontractors, vendors, and suppliers. The baseline schedule must show the contractor's schedule as proposed at the time of award. All work must be completed within the time frame specified in the contract.

The Project Manager may withhold 10% of each monthly progress estimate for failure to submit an original or updated CPM schedule on time and in the manner required. Payment withheld for violation of the schedule requirements will be included in the next progress estimate following the Contractor's submission of the required CPM schedule. The Project Manager's acceptance of the CPM schedule does not attest to the validity of the Contractor's assumptions, logic constraints, dependency relationships, resource allocations, labor and equipment or other schedule aspects.

1. Preparation and Submission of Baseline Schedule. Submit all items listed in Subsection 108.03.2(B).

Attend a meeting scheduled by the Project Manager within 10 calendar days of the Project Manager's receipt of the baseline schedule to discuss, review, correct, or adjust the schedule if required. Make all schedule adjustments and corrections discussed at the meeting and resubmit a revised schedule within 15 calendar days after the meeting.

2. Baseline Schedule Requirements. Include the requirements listed in Subsection 108.03.2(B)(3). Include a baseline Written Narrative (WN) which describes the following:

- Summary of anticipated work in an orderly sequence of the construction phasing.
- Sequence of critical activities and activities with under 3 days of float.
- Anticipated problems and/or risk that may impact the schedule.

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- Anticipated project completion date.
- Anticipated contractual phase or milestone completion dates.
- Anticipated contractor/subcontractor activity manpower, equipment, unit quantities and production rates.

Narratives that are a listing of the work will not be accepted.

3. **Schedule Requirements.** Submit CPM schedules that include:
- a. All critical and contractual activities, and all other activities with durations greater than or equal to 5 days.
 - b. All contractual phases and milestones.
 - c. Activities must identify the party performing each activity. Only one party may perform each activity. Include and describe all subcontractors/suppliers and the area/location of each activity.
 - d. Appropriate activity relationships containing only contractual constraints in the schedule logic.
 - e. Activity durations of no more than 30 days.
 - f. Procurement of permits.
 - g. Material procurement including fabrication and delivery.
 - h. Include separate activities for delivering all major submittals and Department review/approval of submittals in the schedule logic.
 - i. Enterprise calendars adjusted to show planned or actual workdays per week. Include weekends, holidays, or other Contractor non-work periods. Use project specific calendars. All activities must contain an appropriate calendar.
 - j. Adjustments to activity durations and production rates to account for weather, as needed.

Float is defined as the amount of time between when an activity “can start” and when it “must start”. Total float is float shared with all other activities and is defined as the amount of time an activity can be delayed without affecting the overall time of project completion. Float is a shared commodity, not for the exclusive use or financial benefit of either party. Either party has the full use of float until it is depleted. Schedules with negative float will not be accepted unless otherwise approved by the Project Manager.

The critical path is defined as the longest continuous sequence of activities through the network schedule that establishes the minimum overall project duration. The submitted activity sequence and durations must generate a CPM schedule having a critical path, using the longest path method. Keep multiple critical paths and near-critical paths to a minimum. Describe multiple critical paths and near-critical paths with thorough and reasonable justification in the written narrative.

The Department reserves the right to limit the number of activities on the schedule to between 50 and 1000 activities.

All project activity must be identifiable and the progress on each activity must be measurable by the Project Manager at all times.

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4. **Schedule Updates and Progress Payments.** Each month of the project, one week before the end of the project's monthly estimate cycle, submit an electronic .xer file using Primavera P6 and a .PDF file containing:
- a. Actual dates for all activities completed or progressing to the file data date.
 - b. Updated schedule logic for actual or planned work differing from previous schedules.
 - c. A WN describing the following:
 - All changes to the critical path. Discuss why the changes occurred and the overall impact to the project.
 - All critical logic revisions/modifications to the schedule. Include changes in the method or manner of the work, changes in specifications, extra work, changes in duration, etc.
 - Anticipated problems and/or risk that may impact the schedule.
 - Changes to anticipated completion dates, milestones, or phases.
 - Changes to anticipated contractor/subcontractor activity manpower, equipment, unit quantities and production rates.

Ensure monthly schedule and WN updates accurately reflect the actual work progress. Correct errors listed by the Project Manager within 3 business days of notification. The contract time will be adjusted only as specified in the contract. Submit documentation to support requests for time extensions for milestone dates or the contract completion date in accordance with Section 108.07.

If the project work is not proceeding consistently with the Contractor's most recently reviewed project schedule or WN, the Project Manager may suspend work under Subsection 105.01(A) if the WN or schedule does not accurately reflect the actual progress of the work; the suspension may continue until an accurate WN and schedule is submitted.

Attend monthly project progress meetings to compare the schedule to the actual finish dates of completed activities, the remaining duration of uncompleted activities and the proposed logic and/or time estimate revisions. Provide the status of activities at these meetings, and the schedule updates based on this information once it has been verified.

C. CPM Scheduling Method of Measurement

CPM schedule is measured by the lump sum. Other scheduling requirements are not measured for payment.

D. CPM Scheduling Basis of Payment

Payment for all costs associated with CPM scheduling is included in the lump sum contract unit price for CPM scheduling. Payment for all costs associated with other scheduling requirements is included in the payment for other items of work.

Failure to submit a revised CPM schedule as specified may also result in withholding 10% of each monthly progress estimate. Payment withheld for violation of the schedule requirements will be included in the next progress estimate following the Contractor's submission of the required schedule.

Partial payments for CPM scheduling will be made based on the lump sum contract unit price as follows:

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1. 50% when the initial schedule is finalized.
2. 75% when the overall project is 50% complete.
3. 100% when all updates have been submitted.

E. ASC or CPM Failure to Submit

Failure to submit either an ASC or CPM schedule to the Project Manager within 2 calendar days of its due date will result in a monthly deduction in accordance with Table 108-2.

TABLE 108-2
PROJECT SCHEDULE DEDUCTIONS

Original Contract Amount		Monthly Deduction
From More Than	To and Including	
\$ 0	\$ 1,000,000	\$ 300
\$ 1,000,000	\$ 3,000,000	\$ 700
\$ 3,000,000	—	\$ 1,000

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109.06.1 Billing Cycle

Pay all subcontractors within 7 calendar days after receipt of a periodic or final payment from the Department. Payment must be for the full amount due the subcontractor (including retainage) for work performed or materials provided that were included in the periodic or final payment according to the provisions of Section 28-2-2103(2)(a) MCA. A subcontract may not provide for a time longer than the law's mandated 7 calendar days.

REASON: Consistency with language regarding how the Department defines a day.

COMMENTS: No comments received

FINAL: No changes to the draft spec; published as shown.

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108.05 CHARACTER OF WORKERS

Remove any person employed who does not perform work in a proper and skillful manner or who is intemperate, disorderly, unsafe, or verbally abusive. Employees may not return to the project or communicate with Department personnel without the written approval of the Project Manager.

REASON: *Safety*

COMMENTS: *No comments received*

FINAL: ***No changes to the draft spec; published as shown.***

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109.06 Partial Payments

Partial payments will be made once each month ~~following the effective date on the Notice to Proceed,~~ based on estimates of the value of the work performed and materials complete in place under the contract, including materials delivered under Subsection 109.07. No payments will be made for work performed or materials produced without the required permits and authorizations in place as required under Subsection 107.02.

REASON: *allow partial payments prior to NTP.*

COMMENTS: *No comments received*

FINAL: ***No changes to the draft spec; published as shown.***

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208.03.1F Erosion Control Plan

When submitting the MPDES General Permit transfer package/application to the Department, provide verification that all fees have been paid and the permit is ready for transfer in DEQ FACTS (Fees, Applications, and Compliance Tracking System). ~~include a check for the permit transfer fee. Make the check for the fee payable to the DEQ.~~

REASON: *DEQ no longer accepts checks. All payments/processes to be made through their FACTs online system.*

COMMENTS: *No comments received*

FINAL: ***No changes to the draft spec; published as shown.***

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301 Aggregate Surfacing

301.02.2 ~~Binder~~

~~Binder material, for binding and gradation requirements, is fine, natural soil particles or crusher dust, free from grass, roots, weeds, humus, or other deleterious matter. **Reserved**~~

301.02.3 ~~Blending Material~~

~~Blending material is selected natural or crushed mineral aggregate combined with the produced aggregate to meet specifications.~~

~~Do not use pit strippings, overburden, or other deleterious material as blending material.~~

~~Furnish and add blending material to aggregate surfacing materials when required to meet gradation requirements.~~

~~The blending material must not increase the liquid limit and plastic limit of the surfacing material. **Reserved**~~

REASON: *Already defined within testing and gradation requirements*

COMMENTS: *No comments received*

FINAL: **Missed reference to Subsections 301.02.2 & 301.02.3. Additional change shown below.**

701.02.4 Crushed Base Course Type “A”

Meet the following requirements for crushed base course Type “A”:

~~4. Furnish binder meeting Subsection 301.02.2 requirements; and~~

701.02.5 Crushed Base Course Type “B”

~~5. Furnish binder meeting Subsection 301.02.2 requirements; and~~

DRAFT SPECIFICATIONS

409.03.3 SEAL COAT LIMITATIONS

409.03.3 Seal Coat Limitations

3. ~~Perform~~Begin seal coat work when both the ambient and pavement surface temperatures meet the bituminous material supplier's recommended low temperatures. Do not perform seal coat operations when the surface temperature reaches 140 °F or higher.

REASON: *Due to failures from application above 140f. Suppliers recommended the max temperature to be 140f.*

COMMENTS: *No comments received*

FINAL: ***No changes to the draft spec; published as shown.***

DRAFT SPECIFICATIONS

411.03.2 MILLING

Do not start cold milling until the surfacing plant is fully operational and a mix design has been submitted and approved.

REASON: *lessons learned*

COMMENTS: *No comments received*

FINAL: ***No changes to the draft spec; published as shown.***

DRAFT SPECIFICATIONS

501.02.3 DOWEL BARS AND SLEEVES

Epoxy coat the dowel bars, including the ends in accordance with AASHTO M 254 at 10 ± 2 mils. Ensure the bars are coated by an applicator plant listed on the QPL and certified under the CRSI epoxy coating plant certification program for fusion-bonded epoxy applicator plants.

REASON: *Require the ends to be coated*

COMMENTS: *No comments received*

FINAL: ***No changes to the draft spec; published as shown.***

DRAFT SPECIFICATIONS

551.03.7(B) LIQUID MEMBRANE- FORMING CURING COMPOUND

Use white-pigmented compound for pavements. Apply curing compound homogeneously to provide a uniform, solid, white opaque coverage on all exposed concrete surfaces (equal to a white sheet of typing paper) at the time of application.

REASON: consistency with 501 curing

COMMENTS: comments received

FINAL: Editorial changes to the proposed draft. Will include editorial change within Subsection 501.03.8 Curing as well.

Final Acceptance

551.03.7(B) LIQUID MEMBRANE- FORMING CURING COMPOUND

Use white-pigmented compound for pavements. Apply curing compound homogeneously to provide a uniform, solid, white opaque coverage on all exposed concrete surfaces (having an appearance resembling a white sheet) at the time of application.

501.03.8 Curing

2. Apply curing compound homogeneously to provide a uniform, solid, white opaque coverage on all exposed concrete surfaces (equal to a white sheet of typing paper) at the time of application.
2. Apply curing compound homogeneously to provide a uniform, solid, white opaque coverage on all exposed concrete surfaces (having an appearance resembling a white sheet (equal to a white sheet of typing paper)) at the time of application.

602.04.3 Fill and Abandon Pipe

602.2 Materials

2. ~~Fill and~~ Abandon Pipe.

602.03.4 ~~Fill and~~ Abandon Pipe

A. Fill and Abandon Pipe. Place fill material the entire length of the existing pipe to be abandoned so it is completely filled. Ensure that no obstruction or segment of collapsed pipe inhibits placement of fill material. Cap the ends of pipes to prevent material from escaping. ~~Crushing the ends is an acceptable means of capping pipes composed of ductile materials.~~

B. Plug Ends and Abandon Pipe. Place fill material into the pipe for a minimum distance of 10 feet (3 m) from each end and cap in a manner that prevents material from infiltrating the abandoned pipe.

~~Crushing the ends is an acceptable means of capping pipes composed of ductile materials.~~

602.04.3 ~~Fill and~~ Abandon Pipe

A. Fill and Abandon Pipe. This work will be measured based on the volume of material required to fill existing pipes. The volume will be determined based on the nominal diameter and effective length of the pipe to calculate the cubic yards (~~cubic meters~~) m^3) of material required.

B. Plug Ends and Abandon Pipe. This work will be measured by each pipe once capping is completed.

602.05 Basis of Payment

Plug Ends and Abandon Pipe Each

REASON: Standard Hydraulics Special

COMMENTS: No comments received

FINAL: No changes to the draft spec; published as shown.

DRAFT SPECIFICATIONS

612 Painting

612.02.1 Paint Coat Systems

A. Existing Structural Steel. If existing steel is to be painted, the contract requirements will specify whether to fully remove the existing paint, or to apply additional paint over an existing coating.

- 1. Full Removal of Existing Paint.** Furnish a system meeting New Structural Steel Requirements. Except use an organic zinc primer.

612.03.1 Submittals.

612.03.4 Painting

C. Application

3. Field Stripe Coat Requirements. A stripe coat of the primer and second (Intermediate) coat is required. Striping of the primer coat is permitted after the full application of the primer coat is completed and recoat times are met. Both stripe coats will be tinted in accordance with the manufacturer's recommendation. The stripe coat for both the primer and second coat must be applied using a brush, dauber, or roller to all edges, corners, lattice, angles, rivets, bolts, nuts, washers, welds, sharp and or thin edges, in between built-up members, the top face of the top flange of girders with cast-in-place concrete decks. Unless agreed upon, no thinning of the stripe coats is allowed.

REASON: *Industry recommended*

COMMENTS: *MDT comments received*

Final Acceptance

3. Stripe Coat Requirements. Stripe coat the primer and second (Intermediate) coat. Striping of the primer coat is permitted after the full application of the primer coat is completed and recoat times are met. Tint both stripe coats in accordance with the manufacturer's recommendation. Apply the stripe coat for both the primer and second coat using a brush, dauber, or roller to all edges, corners, lattice, angles, rivets, bolts, nuts, washers, welds, sharp and or thin edges. Do not thin paint without written approval.

617 Traffic Signals and Lighting

556.03.8 Bolted Connections – High Tensile Strength Bolts

B. Pre-Installation. Submit 1 of the following bolt methods for use:

- a. Turn of the nut,
- b. Calibrated wrench,
- c. Direct Tension Indicator (DTI), or
- d. Tension Control Bolts (twist-off)

Pre-Installation verification is not required for structural support for highway signs, luminaires, and traffic signals. Not applicable to breakaway connections.

FINAL: No changes to the draft spec; published as shown.

617.03.7 Standards

Install signal standards in accordance with Subsection 703.04.7.

Field drill other holes for wire entry, mounting pedestrian and vehicle signals, or pedestrian pushbuttons. Treat the holes or threads with a cold galvanizing compound following the manufacturer's recommendations. Seal unused pipe tenons on mast arms with metal caps.

Final Acceptance: Install signal standards in accordance with Subsections 556.03.8 and 703.04.5.

617.03.8 Luminaires

Install signal standards in accordance with Subsection 703.04.7.

Check luminaires on the ground to ensure they provide the specified ANSI/IES light distribution pattern before mounting. Adjust the luminaires at night, as directed, to provide the best roadway light distribution. Notify the Project Manager when the luminaire system is complete. The luminaires may be put into operation when necessary for public use as directed by the Project Manager.

Final Acceptance: Install Luminaires in accordance with Subsections 556.03.8 and 703.04.5.

703.04.7 ~~Reserved~~Anchor Bolt Tensioning for Ancillary Structures

Anchor bolt/nut installation requirements for all traffic structures designed in accordance with "LRFD Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals". Not applicable to breakaway connections.

A. Definitions.

1. Double nut connections: Base plate connections having a leveling nut/washer below the plate and a washer/nut above the plate.
2. Star tightening pattern: A pattern where the nuts on opposite or near opposite sides of the anchor bolt circle are successively tightened in a pattern resembling a star.

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4.3. Wrench tightened anchor nut: The maximum nut rotation resulting from the effort of one person using a 12-inch-long wrench. (Applicable to anchor nuts only).

B. Requirements. Install anchor bolts in anchor base connections in accordance with Section 15 of the current edition of the LRFD Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals and as specified in this special provision.

1. Pretension double nut connections to the following procedure.

- a) Clean and lubricate the exposed threads of anchor bolts and nuts with beeswax.
- b) Align leveling nuts to same elevation and place hardened structural washers atop. Ensure the distance between the bottom of the leveling nut and the top of the foundation is not more than the rod diameter.
- c) Set base plate, structural washers and install top nuts.
- d) Wrench tighten the top nuts in a star pattern.
- e) Wrench tighten the leveling nuts in a star pattern.
- f) Tighten top nuts to snugging torque in a star pattern.
- g) Mark the reference position of each top nut with a suitable marking on one flat, with a corresponding reference mark on the base plate at each bolt.
- h) Incrementally turn the top nuts using a star pattern until achieving the required nut rotating specified in the table below. Turn the nuts in at least two full tightening cycles.

Table 703-1
Required Nut Rotation

<u>Anchor Rod Diameter (inch)</u>	<u>Nut Rotation Beyond Snug Tight ^{1,2}</u>		
	<u>ASTM F1554 Grade 36</u>	<u>ASTMs F1554 Grade 55</u>	<u>ASTMs F1554 Grade 105</u>
<u><1</u>	<u>105°</u>	<u>105°</u>	<u>120°</u>
<u>≥1 and <1 1/2</u>	<u>75°</u>	<u>75°</u>	<u>90°</u>
<u>≥1 ½ and ≤2</u>	<u>60°</u>	<u>60°</u>	<u>90°</u>

Notes:

1. Nut rotation is relative to anchor bolt. The tolerance is plus 15 degrees.
2. Use a beveled washer if the nut is not in firm contact with the base plate or if the outer face of the base plate is sloped more than 1:40.
 - i) Check the installation by applying the verification torque to the top nut. Notify the project manager if the verification torque cannot be achieved.
3. For galvanized anchor rods, apply 110% of the verification torque after 48 hours but not more than 96 hours after the initial pre-tensioning.

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Table 703-2
Verification Torque

<u>Diameter</u> <u>(inch)</u>	<u>ASTM F1554 Grade 36</u>		<u>ASTM F1554 Grade 55</u>		<u>ASTM F1554 Grade 105</u>	
	<u>Snugging</u> <u>Torque</u> <u>(ft-lbf)</u>	<u>Verification</u> <u>Torque</u> <u>(ft-lbf)</u>	<u>Snugging</u> <u>Torque</u> <u>(ft-lbf)</u>	<u>Verification</u> <u>Torque</u> <u>(ft-lbf)</u>	<u>Snugging</u> <u>Torque</u> <u>(ft-lbf)</u>	<u>Verification</u> <u>Torque</u> <u>(ft-lbf)</u>
<u>1</u>	<u>50</u>	<u>180</u>	<u>70</u>	<u>280</u>	<u>120</u>	<u>460</u>
<u>1 1/8</u>	<u>70</u>	<u>250</u>	<u>100</u>	<u>390</u>	<u>170</u>	<u>650</u>
<u>1 1/4</u>	<u>90</u>	<u>360</u>	<u>140</u>	<u>550</u>	<u>230</u>	<u>910</u>
<u>1 3/8</u>	<u>120</u>	<u>470</u>	<u>180</u>	<u>720</u>	<u>300</u>	<u>1,200</u>
<u>1 1/2</u>	<u>160</u>	<u>620</u>	<u>240</u>	<u>950</u>	<u>400</u>	<u>1,590</u>
<u>1 3/4</u>	<u>250</u>	<u>970</u>	<u>380</u>	<u>1,500</u>	<u>630</u>	<u>2,500</u>
<u>2</u>	<u>370</u>	<u>1,450</u>	<u>570</u>	<u>2,250</u>	<u>940</u>	<u>3,750</u>
<u>2 1/4</u>	<u>530</u>	<u>2,120</u>	<u>830</u>	<u>3,290</u>	<u>1,380</u>	<u>5,490</u>
<u>2 1/2</u>	<u>730</u>	<u>2,900</u>	<u>1,130</u>	<u>4,500</u>	<u>1,880</u>	<u>7,500</u>
<u>2 3/4</u>	<u>990</u>	<u>3,940</u>	<u>1,530</u>	<u>6,110</u>	<u>2,550</u>	<u>10,180</u>
<u>3</u>	<u>1,300</u>	<u>5,200</u>	<u>2,020</u>	<u>8,060</u>	<u>3,360</u>	<u>13,430</u>
<u>3 1/4</u>	<u>1,680</u>	<u>6,700</u>	<u>2,600</u>	<u>10,390</u>	<u>4,330</u>	<u>17,310</u>
<u>3 1/2</u>	<u>2,120</u>	<u>8,460</u>	<u>3,280</u>	<u>13,120</u>	<u>5,470</u>	<u>21,870</u>
<u>3 3/4</u>	<u>2,630</u>	<u>10,510</u>	<u>4,080</u>	<u>16,300</u>	<u>6,790</u>	<u>27,160</u>
<u>4</u>	<u>3,220</u>	<u>12,860</u>	<u>4,990</u>	<u>19,950</u>	<u>8,320</u>	<u>33,250</u>

REASON: *Standard Traffic Special*

COMMENTS: *comments*

FINAL: ***No changes to the draft spec; published as shown.***

DRAFT SPECIFICATIONS

619 Signs and Delineators

619.03.1 Definitions

B-A. Replace Sign Face. Signs designated “Replace Sign Face” are to be removed from the supports and replaced with the specified new signs using the existing supports at the same mounting height as the replaced sign, unless otherwise indicated in the plans.

619.03.3 Fabrication and Erection

Install bolted connections in accordance with Subsections 556.03.8 and 703.04.7.

619.03.14 Linear Delineation Systems

A. Concrete Barrier Rail. Install 2 panels per section of concrete barrier rail. Equally space the panels on the barrier rail. Prepare the concrete barrier to ensure proper fastening prior to installation. Install linear delineation in accordance with the manufacturer installation procedures and requirements.

Mount maximum distance of 2 inches (50 mm) from the top edge of the standard concrete median barrier. Mount the panels at the same height above the roadway on both standard and tall barrier rail.

B. W-Beam Guardrail. Furnish 34 inch long by 1.5 inches wide delineation panels that meet one of the following:

1. Panels fabricated from ASTM type XI retro-reflective sheeting laminated onto a thin gauge of aluminum and formed to a unique shape, or

2. Bond an angular retro-reflective coating onto a structural substrate.

Prepare the metal guardrail to ensure proper fastening prior to installation and install delineation panels per manufacturers recommendations. Mount the panels in the inside middle groove on the W-Beam and install:

a) 4 panels evenly spaced over every 25-foot piece of rail.

b) 2 panels evenly spaced over every 12.5-foot piece of rail.

c) Do not mount panels on optional terminal sections.

619.05.13 Basis of Payment

Delineation – Linear-W-Beam (each)

REASON: Add special Provisions to Specs

COMMENTS: *comments received from contractors*

FINAL: **Published as shown with the exception of the following sentence:**

Install 26 to 36 inch long by 1.5 inches wide delineation panels that meet one of the following:

Install bolted connections in accordance with Subsections 556.03.8 and 703.04.5.

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701.02 Aggregate for Surfacing

701.02.1 General Requirements

Furnish aggregate that does not contain wood and other plant material.

~~Do not use scoria (fired clay commonly found in conjunction with burned coal in the lignite fields of the State) as aggregate. Sources of scoria are common but not limited to Daniels, Sheridan, Roosevelt, McCone, Dawson, Prairie, Wibaux, Custer, Fallon, Rosebud, Treasure, Bighorn, Powder River, and Carter Counties.~~

701.03.1 General Requirements

Furnish aggregate that does not contain wood and other plant material.

~~Do not use scoria (fired clay commonly found in conjunction with burned coal in the lignite fields of the State) as aggregate to be bituminized. Sources of scoria are common but not limited to Daniels, Sheridan, Roosevelt, McCone, Dawson, Prairie, Wibaux, Custer, Fallon, Rosebud, Treasure, Bighorn, Powder River, and Carter Counties.~~

REASON: *Scoria cannot be measured or quantified. The special has been removed.*

COMMENTS: *No comments received*

FINAL: ***No changes to the draft spec; publish as shown.***

ADDED SPECIFICATION

702.01 MSCR PGAB

402.03.8 Performance Graded Asphalt Binder (PGAB)

Furnish PGAB meeting Table 702-2 requirements and MSCR PGAB in accordance with Section 702 for the binder specified in the contract. PG 64-28, PG 64-34 and PG 70-28 binders, after aging in the rolling thin film oven, and testing in accordance with AASHTO T 51 must meet the following:

702.01 BITUMINOUS MATERIALS

A. Furnish bituminous materials in accordance with following tables.

Cationic Emulsified Asphalt.....	AASHTO M 208 ¹ , Table 1
Emulsified Asphalt	AASHTO M 140 ¹ , Table 1
High Float Emulsions	Table 702-4
Medium Curing Liquid Asphalt (MC).....	Table 702-3
Performance Graded Asphalt Binder.....	Table 702-2
MSCR Performance Graded Asphalt Binder.....	AASHTO M 332 ²
Polymer-Modified Cationic Emulsified Asphalt ...	AASHTO M 316

Note 1. Cement mixing test does not apply when SS-1 or CSS-1 emulsion is used for spray or tack application.

Note 2. Minimum 55% recover @ 3.2 kPa according to AASHTO T 350 or as specified in the contract.

REASON: added this to the June update to the Standard Specifications without review by the MCA because we are not changing our operation or our direction to the Contractor, we are only adding a material specification for the eventuality of it's future use. Also, since MSCR PGAB is governed by an AASHTO material specification, there is nothing to comment on other than the 55% recovery requirement which has already been present to and discussed with the MCA during the initial MSCR PG 58V-34 discussions.

Our evaluation of the binder will remain as is currently documented in the standard specifications for the time being. MSCR PG 58V-34 has already been approved for addition to Section MT 601 for the June Materials Manual update, so that update has already been addressed and approved.

703.04.1 General

A. Lighting Standards. Fabricate the traffic signal standards in accordance with Section 556, the detail for 2015 LRFD Type 2A and 3A Signal Standards, Foundation Details, and Typical Signal Mountings; and the 2015 AASHTO LRFD Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals and any amendments thereto.

For design purposes, the signal and luminaire loading are as shown on the detail drawing.

Weld hubs for wire entry prior to galvanization.

Manufacture tubular members 50 feet (15.2 m) in length or less using the same gauge steel for the entire length of the member.

1. Pole Shaft. The tube portion of the shaft must be round when viewed in the plane perpendicular to its longitudinal axis. Manufacture the pole tube from one piece of steel having a single continuous linear taper of 0.14 in/ft. Show on the shop drawings the orientation and location of the longitudinal seam of the tube. Rotate the longitudinal seam weld so it does not coincide with hand holes, tenons, gusset plates or other welds on the shaft. Weld the seam using a continuous automatic electric weld.

Circumferentially weld a one-piece steel plate with holes in the corners for mounting and one in the center for wire access to both the top and the bottom of the tube. Use a similar plate on the side of the tube for mounting the traffic signal mast arm. Ensure the attachment of the traffic signal mast arm plate accommodates full-sized hardened flat washers for bolting the mast arm to the shaft.

Fabricate the shaft from No. 0 manufacturer's standard gauge steel, or thicker, with a guaranteed minimum yield strength of 55,000 psi (379211 kPa) after fabrication. Specify the type of steel to be used on the shop drawing.

Provide a 4 x 8-inch (102 x 203 mm) hand hole located 180° from the traffic signal mast arm near the base of the shaft and a 4 x 6-½ inch (102 x 165 mm) hand hole near the mounting point of the traffic signal mast arm as shown on the detail drawing. Provide a removable galvanized metal cover with each hand hole. Hold the hand hole cover in place with 2 stainless steel hex-head type screws in holes that are field-drilled in the covers. Rotate longitudinal seam 90° from the hand hole.

Provide a 3 inch (76 mm) internally threaded pipe coupling protruding 2 inches (50 mm) from the side of the pole tube located 30 inches (760 mm) from the pole base and 180° from the traffic signal mast arm as shown in the detail drawing. Provide a 3-inch (76 mm) metal plug to be used for sealing this pipe coupling.

Provide a ½-inch ground lug inside the shaft, near the base and within reach of the hand hole for attaching a ground wire.

2. Shaft Base. Circumferentially weld a hot rolled steel plate to the shaft prior to galvanizing. Furnish 4 high strength steel bolts with headed ends at the bottom and a minimum of 12 inch (305 mm) threaded and galvanized at the top. Furnish 2 nuts and 2 washers with each anchor bolt to adjust over and

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under the base for plumbing and raking of the standard, and 1 nut at the bottom of each anchor bolt. Furnish each anchor bolt as shown on the Detailed Drawing.

- 3. Signal Mast Arm.** Fabricate the traffic signal mast arm from No. 7 manufacturer's standard gauge steel, or thicker, with a guaranteed minimum yield strength of 55,000 psi (379211 kPa) after fabrication. Specify the type of steel to be used on the shop drawing.

The tube portion of the mast arm must be round when viewed in the plane perpendicular to its longitudinal axis. Construct the tube for the mast arm using 1 or 2 pieces of steel, based on the mast arm length. For mast arms that are 35 feet (10.6 m) in length or less, only one piece of steel may be used. Two pieces of the same gauge steel may be used for mast arms longer than 35 feet (10.6 m). However, manufacture all mast arms 50 feet (15.2 m) in length or less to end up as, and be shipped as, one continuous piece. Weld all circumferential splices. Bolting sections together is not allowed. Show the orientation and location of all seams along the tube on the shop drawing. Rotate longitudinal seams at the intersection of a circumferential seam. Base the amount of rotation on 360° around the circle of the circumferential seam. Rotate any 2 longitudinal seams intersecting a specific circumferential seam by a minimum of 45° from each other on that circle.

Manufacture 55-foot (16.7 m) and 60-foot (18.3 m) mast arms in two pieces. The base of both mast arms must be interchangeable and conform to the detail drawing for the connection plate and bolt circle. The base section of the mast arms should be approximately 12 feet -7 inches in length and allow for approximately 2 feet – 6 inches of overlap between the base section of the mast arm and the outer section of the mast arm. The outer section for the 55-foot mast arm should be approximately 45 feet (13.7 m) in length. The outer section for the 60-foot mast arm should be approximately 50 feet (15.2 m) in length. The base section and the outer section of these mast arms may be formed from 2 different gauge steels. However, each section must be constructed from 1 gauge of steel. Bolt the outer section to the base section of the mast arm by field drilling a ¾-inch hole in the base section and installing a ⅝-inch through bolt with lock washer and nut. The outer section may be pre-drilled for the through bolt but must form a tight slip joint connection with the base section.

Drill the appropriate diameter hole (2, 1-½, ¾ inch) in the traffic signal mast arm at the location of each tenon. Factory weld tenons on the mast arm as shown on the plan sheet prior to galvanizing. Do not locate tenons in a welded seam. Furnish galvanized metal caps for each tenon on the arm, and a galvanized metal mast arm end cap secured with hex-head screws and/or a through bolt for securely fastening the end cap to the mast arm. Alternative mast arm end caps may be submitted for review by the Department. However, the Department has the sole discretion to accept, or reject, alternative mast arm end caps without justification.

Circumferentially weld a one-piece steel mounting plate to the end of the mast arm. The mounting plate for the mast arm and the plate mounted on the

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pole shaft utilize holes in each corner for mounting and one in the center for wire access.

Furnish the mast arms capable of sustaining loads as shown on the detail drawing.

Specify on the shop drawing the type of steel to be used in the mast arm.

- 4. Luminaire Extension & Mast Arm.** Each luminaire extension and mast arm are made up of 2 major parts, the luminaire mast arm, and the luminaire extension. The luminaire extension is the part between the luminaire mast arm and the pole shaft.

Construct the tube for the luminaire mast arm in the same manner and to the same requirements as the traffic signal mast arm tube, except for the thickness of the steel. Use a minimum No. 11 manufacturer's standard gauge steel to form the luminaire mast arm. Attach, or form, the end of the luminaire mast arm to a 2-inch (50 mm) pipe size slip-fitter tenon a minimum of 6 inch (152 mm) in length.

Circumferentially weld a one-piece steel plate to one end of the mast arm tube for mounting the mast arm to the luminaire extension. Drill holes in the corners for mounting and one in the center for wire access.

Construct the tube part of the extension in the same manner as the tube for the pole shaft. Use a minimum of No. 11 manufacturer's standard gauge steel for the luminaire extension tube.

Circumferentially weld a one-piece steel plate with holes in the corners and one in the center for wire access to the bottom of the extension. Use a similar plate for mounting the luminaire mast arm. Furnish a metal removable top cap secured in place using galvanized or stainless-steel set screws and/or a through bolt to prevent moisture from entering the inside of the luminaire extension.

Specify on the shop drawing the type of steel to be used in the luminaire extension and mast arm.

- 5. Finish.** Galvanize pole shafts, signal arms, luminaire extensions and mast arms inside and out. Galvanize, or cadmium plate, all mounting hardware, fasteners, caps, plugs and covers. The Department must approve any repair of the galvanized coating during fabrication. Detail the locations of the repair areas must be submitted with the type of coating to be used. The coating must match, to the extent possible, the brightness of the remaining structure.
- 6. Manufacturer.** The manufacturer of the signal standards is required to be pre-qualified under the American Institute of Steel Construction (AISC) Certification program. The manufacturer must have an AISC certification in one of the following categories to fabricate these signal standards:

- Simple Steel Bridge Structures (SBR).
- Bridge and Highway Metal Component Manufacturers (CPT).

Submit proof of certification with shop drawing submittals.

Package all non-major parts in individual packages that are durable, water tight and labeled as given in the following table:~~Furnish standards fabricated and inspected in accordance with Section 556 and designed to the 1994 AASHTO~~

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Standard Specifications for Structural Supports for Highway Signs, Luminaries, and Traffic Signals.

TABLE 703-1
PACKAGING TABLE

<u>Title</u>	<u>Related Part</u>	<u>Material Included</u>
<u>S.A. (Fill in w/Arm Length)</u>	<u>Signal Mast Arm</u>	<u>Mast arm end cap, caps for tenons, mast arm connection bolts with nuts and hardened, complete flat washers</u>
<u>L.E. (Fill in w/35 ,40 , 45 foot)</u>	<u>Luminaire Extension</u>	<u>Removable metal cap for the top of the extension, luminaire mast arm connection bolts with nuts and hardened, complete flat washers, extension connection bolts with nuts and hardened, complete flat washers</u>
<u>P.S. (Fill in w/Type 1, 2 or 3)</u>	<u>Pole Shaft</u>	<u>Grounding lug, hand hole covers and fasteners, 3-inch metal plug, pole shaft top bolts with nuts and washers</u>

1. Package the anchor bolt nuts and washers together for a complete traffic signal pole installation, e.g., package 12 nuts and 8 washers in one package. Label each package for either 2" anchor bolts or 1-3/4" anchor bolts.
2. Ship the anchor bolts separately and void of the nuts and washers.

A.B. Luminaire Standards. Use a minimum luminaire dead load of 77 lb (35 kg), and a minimum luminaire projected area of 3.3 square feet (0.3 m²) for design purposes. Use a design wind velocity for all standards of 90 miles per hour. Include on the shop drawings the following reaction data at the base of the pole, reported as reactions normal to the standard global coordinate system:

- Moment X (MX) Ft.-Lb.
- Moment Y (MY) Ft.-Lb.
- Torsion Z (MZ) Ft.-Lb.
- Shear force X (VX) Lb.
- Shear force Y (VY) Lb.
- Axial load (P) Lb.

Fabricate all standards from steel. Meet the standard manufacturer's requirements for the anchor bolt placement in the foundation.

703.04.6 Welding Steel

Meet the requirements of Section 624 and the following:

Ensure that all Nondestructive Testing is performed by personnel qualified in conformance with the American Society for Nondestructive Testing Recommended Practice *No. SNT-TC-1A* to minimum Testing Level II for the individual methods. Provide ASNT certifications and procedures before testing. Denote the WPS identification in the tail of the weld symbol for all welds shown on the shop drawings.

Visually inspect 100% of all welds.

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Meet all the applicable AASHTO and AWS welding inspection requirements including those modified as follows:

- 1. Circumferential Weld Splices.** Use full-penetration (i.e., complete-penetration) groove welds for pole and arm sections joined by circumferential welds. Perform radiographic testing or ultrasonic testing as approved by the Project Manager meeting AWS D1.1, Structural Welding Code, Section 6. No repair of circumferential welds is authorized without written approval by the Department.
- 2. Longitudinal Seams.** Longitudinal seam welds for pole and arm sections must have 60% minimum penetration, except for the following areas:
 - a) Provide full penetration groove welds for longitudinal seam welds within 6 inches of circumferential welds.
 - b) Provide full-penetration longitudinal seam groove welds for a length equal to the minimum splice length authorized on the female section of telescopic (i.e., slip type) field splices.Inspect 100% of all full penetration groove welds using radiography or testing may be by ultrasonic test methods AWS D1.1, Structural Welding Code Ultrasonic, Section 6, both above test methods to be approved by the Project Manager before use.

Randomly test 25% of all partial penetration welds and fillet welds per component using magnetic particle test methods.
- 3. Base Connection Welds.** Inspect 100% of full-penetration groove welds by nondestructive methods of radiography or ultrasonics approved by the Department's Bridge Bureau.

Inspect 25% of all fillet welds per assembly, by Magnetic Particle (MT) methods.~~Randomly inspect 25% of all base connection welds and all fillet welds using magnetic particle testing specified in AWS D 1.1, Structural Welding Code, Section 6.~~
- 4. Fillet Welds/Attachment Welds.** Inspect 25% of all fillet welds per assembly, by Magnetic Particle (MT) methods.

703.04.10 Inspection

- a) Visual Weld Inspectors.** Inspections are to be performed by currently certified American Welding Society Certified Welding Inspectors (CWI).
- b) Nondestructive Testing.** All personnel performing NDT must be currently certified in accordance with the American Society for Nondestructive Testing (ASNT) to a Level II certification.

Perform non-destructive testing at no cost to the Department.

The Contractor must furnish all labor, equipment, and material necessary to provide the Department inspector access to the poles.

Standards may be inspected at the point of fabrication and will be inspected upon delivery. Where inspection reveals defects in structural adequacy, quality, or workmanship, repair the pole shaft, signal mast arm, luminaire extension, luminaire mast arm or mounting hardware to the sole satisfaction of the Department at no cost.

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If after a second inspection, the same defects are present that were revealed in the first inspection, the component that is defective will be rejected. Refabricate all rejected components. The Department will pay all QA inspection costs involved in the first inspection. All other costs, both for material and inspection after the first inspection, are the responsibility of the contractor.

~~All standards will be inspected at the project before they are erected and may be inspected where fabricated.~~

REASON: *Standard Special - Traffic*

COMMENTS: *Internal (MDT) and external (contractor, supplier) comments received*

Final acceptance on next page (changes to proposed in yellow)

Subsections 703.04.3 Type 2 and 3 Signal Standards and 703.04.4 Type 10 Luminaire Standards are covered by the addition of the special provision and are added in 701.03.1. They were not included in the proposed specs as being deleted. Due to the rewrite, parts of 703.04.5 Mast Arms were also included and those changes are also shown.

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Final Acceptance

703.04.1 General

Design, fabricate, and inspect standards in accordance with the current edition of AASHTO LRFD Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals.

A. Signal Standards. Design, fabricate, and inspect in accordance with Section 556 and the detail for 2015 LRFD Type 2A and 3A Signal Standards.

For design purposes, the signal and luminaire loading are shown on the detail drawing.

Weld hubs for wire entry prior to galvanization.

Manufacture tubular members 50 feet (15.2 m) in length or less using the same gauge steel for the entire length of the member.

- 1. Pole Shaft.** The tube portion of the shaft must be round when viewed in the plane perpendicular to its longitudinal axis. Manufacture the pole tube from one piece of steel having a single continuous linear taper of 0.14 in/ft. Show on the shop drawings the orientation and location of the longitudinal seam of the tube. Rotate the longitudinal seam weld so it does not coincide with hand holes, tenons, gusset plates or other welds on the shaft. Weld the seam using a continuous automatic electric weld.

Circumferentially weld a one-piece steel plate with holes in the corners for mounting and one in the center for wire access to both the top and the bottom of the tube. Use a similar plate on the side of the tube for mounting the traffic signal mast arm. Ensure the attachment of the traffic signal mast arm plate accommodates full-sized hardened flat washers for bolting the mast arm to the shaft.

Fabricate the shaft from No. 0 manufacturer's standard gauge steel, or thicker, with a guaranteed minimum yield strength of 55,000 psi (379,211 kPa) after fabrication. Specify the type of steel to be used on the shop drawing.

Provide a 4 x 8-inch (102 x 203 mm) hand hole located 180° from the traffic signal mast arm near the base of the shaft and a 4 x 6-½ inch (102 x 165 mm) hand hole near the mounting point of the traffic signal mast arm as shown on the detail drawing. Provide a removable galvanized metal cover with each hand hole. Hold the hand hole cover in place with 2 stainless steel hex-head type screws in holes that are field-drilled in the covers. Rotate longitudinal seam 90° from the hand hole.

Provide a 3 inch (76 mm) internally threaded pipe coupling protruding 2 inches (50 mm) from the side of the pole tube located 30 inches (760 mm) from the pole base and 180° from the traffic signal mast arm as shown in the detail drawing. Provide a 3-inch (76 mm) metal plug to be used for sealing this pipe coupling.

Provide a ½-inch ground lug inside the shaft, near the base and within reach of the hand hole for attaching a ground wire.

- 2. Shaft Base.** Circumferentially weld a hot rolled steel plate to the shaft prior to galvanizing. Furnish 4 high strength steel bolts with a minimum yield strength

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of 55 ksi, headed ends at the bottom, and a minimum of 12 inch (305 mm) threaded and galvanized at the top. Furnish 2 nuts and 2 washers with each anchor bolt to adjust over and under the base for plumbing and raking of the standard, and 1 nut at the bottom of each anchor bolt. Furnish each anchor bolt as shown on the Detailed Drawing.

- 3. Signal Mast Arm.** Fabricate the traffic signal mast arm from No. 7 manufacturer's standard gauge steel, or thicker, with a guaranteed minimum yield strength of 55,000 psi (379211 kPa) after fabrication. Specify the type of steel to be used on the shop drawing.

The tube portion of the mast arm must be round when viewed in the plane perpendicular to its longitudinal axis. Construct the tube for the mast arm using 1 or 2 pieces of steel, based on the mast arm length. For mast arms that are 35 feet (10.6 m) in length or less, only one piece of steel may be used. Two pieces of the same gauge steel may be used for mast arms longer than 35 feet (10.6 m). However, manufacture all mast arms 50 feet (15.2 m) in length or less to end up as, and be shipped as, one continuous piece. Weld all circumferential splices. Bolting sections together is not allowed. Show the orientation and location of all seams along the tube on the shop drawing. Rotate longitudinal seams at the intersection of a circumferential seam. Base the amount of rotation on 360° around the circle of the circumferential seam. Rotate any 2 longitudinal seams intersecting a specific circumferential seam by a minimum of 45° from each other on that circle.

Manufacture 55-foot (16.7 m) and 60-foot (18.3 m) mast arms in two pieces. The base of both mast arms must be interchangeable and conform to the detail drawing for the connection plate and bolt circle. The base section of the mast arms should be approximately 12 feet -7 inches in length and allow for approximately 2 feet – 6 inches of overlap between the base section of the mast arm and the outer section of the mast arm. The outer section for the 55-foot mast arm should be approximately 45 feet (13.7 m) in length. The outer section for the 60-foot mast arm should be approximately 50 feet (15.2 m) in length. The base section and the outer section of these mast arms may be formed from 2 different gauge steels. However, each section must be constructed from 1 gauge of steel. Bolt the outer section to the base section of the mast arm by field drilling a ¾-inch hole in the base section and installing a 5/8-inch through bolt with lock washer and nut. The outer section may be pre-drilled for the through bolt but must form a tight slip joint connection with the base section.

Drill the appropriate diameter hole (2, 1-½, ¾ inch) in the traffic signal mast arm at the location of each tenon. Factory weld tenons on the mast arm as shown on the plan sheet prior to galvanizing. Do not locate tenons in a welded seam. Furnish galvanized metal caps for each tenon on the arm, and a galvanized metal mast arm end cap secured with hex-head screws and/or a through bolt for securely fastening the end cap to the mast arm. Alternative mast arm end caps may be submitted for review by the Department. However, the Department has the sole discretion to accept, or reject, alternative mast arm end caps without justification.

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Circumferentially weld a one-piece steel mounting plate to the end of the mast arm. The mounting plate for the mast arm and the plate mounted on the pole shaft utilize holes in each corner for mounting and one in the center for wire access.

Furnish the mast arms capable of sustaining loads as shown on the detail drawing.

Specify on the shop drawing the type of steel to be used in the mast arm.

- 4. Luminaire Extension & Mast Arm.** Each luminaire extension and mast arm are made up of 2 major parts, the luminaire mast arm, and the luminaire extension. **The luminaire extension is the vertical section between the luminaire mast arm and the lower vertical section of the standard.**

Construct the tube for the luminaire mast arm in the same manner and to the same requirements as the traffic signal mast arm tube, except for the thickness of the steel. Use a minimum No. 11 manufacturer's standard gauge steel to form the luminaire mast arm. Attach, or form, the end of the luminaire mast arm to a 2-inch (50 mm) pipe size slip-fitter tenon a minimum of 6 inch (152 mm) in length.

Circumferentially weld a one-piece steel plate to one end of the mast arm tube for mounting the mast arm to the luminaire extension. Drill holes in the corners for mounting and one in the center for wire access.

Construct the tube part of the extension in the same manner as the tube for the pole shaft. Use a minimum of No. 11 manufacturer's standard gauge steel for the luminaire extension tube.

Circumferentially weld a one-piece steel plate with holes in the corners and one in the center for wire access to the bottom of the extension. Use a similar plate for mounting the luminaire mast arm. Furnish a metal removable top cap secured in place using galvanized or stainless-steel set screws and/or a through bolt to prevent moisture from entering the inside of the luminaire extension.

Specify on the shop drawing the type of steel to be used in the luminaire extension and mast arm.

- 5. Finish.** Galvanize pole shafts, signal arms, luminaire extensions and mast arms inside and out. Galvanize, or cadmium plate, all mounting hardware, fasteners, caps, plugs and covers. The Department must approve any repair of the galvanized coating during fabrication. Detail the locations of the repair areas must be submitted with the type of coating to be used. The coating must match, to the extent possible, the brightness of the remaining structure.
- 6. Manufacturer.** The manufacturer of the signal standards is required to be pre-qualified under the American Institute of Steel Construction (AISC) Certification program. The manufacturer must have an AISC certification in one of the following categories to fabricate these signal standards:
 - Simple Steel Bridge Structures (SBR).
 - Bridge and Highway Metal Component Manufacturers (CPT).Submit proof of certification with shop drawing submittals.

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Package all non-major parts in individual packages that are durable, water tight and labeled as given in the following table:

**TABLE 703-1
PACKAGING TABLE**

Title	Related Part	Material Included
S.A. (Fill in w/Arm Length)	Signal Mast Arm	Mast arm end cap, caps for tenons, mast arm connection bolts with nuts and hardened, complete flat washers
L.E. (Fill in w/35 ,40 , 45 foot)	Luminaire Extension	Removable metal cap for the top of the extension, luminaire mast arm connection bolts with nuts and hardened, complete flat washers, extension connection bolts with nuts and hardened, complete flat washers
P.S. (Fill in w/Type 1, 2 or 3)	Pole Shaft	Grounding lug, hand hole covers and fasteners, 3-inch metal plug, pole shaft top bolts with nuts and washers

4.3. Package the anchor bolt nuts and washers together for a complete traffic signal pole installation, e.g., package 12 nuts and 8 washers in one package. Label each package for either 2" anchor bolts or 1-3/4" anchor bolts.

2.4. Ship the anchor bolts separately and void of the nuts and washers.

B. Luminaire Standards. Design, fabricate, and inspect in accordance with the detail for the 2015 LRFD Type 10-A Pole, Base, and Foundation. Furnish a canister style vibration damper. Use a minimum luminaire dead load of 55 lb (25 kg), and a minimum luminaire projected area of 2 square feet (0.19 m²) for design purposes. Include on the shop drawings the following reaction data at the base of the pole, reported as reactions normal to the standard global coordinate system:

- Moment X (MX) Ft.-Lb.
- Moment Y (MY) Ft.-Lb.
- Torsion Z (MZ) Ft.-Lb.
- Shear force X (VX) Lb.
- Shear force Y (VY) Lb.
- Axial load (P) Lb.

Fabricate all standards from steel. Meet the standard manufacturer's requirements for the anchor bolt placement in the foundation.

Shafts must be a single section formed into a round, continuous taper with a single, automatic electrically welded seam, or approved equal. Steel shafts must be a minimum No. 11 Manufacturers Standard Gauge.

Show the type of steel on the manufacturer's shop drawings.

Furnish rain-tight metal covers for the top of each shaft.

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Shafts not mounted on transformer bases must have a handhole with removable cover and an internal grounding lug, as shown in the contract. Locate the handhole in the same quadrant as the mast arm.

Shafts mounted on transformer bases do not require a handhole or grounding lug.

The shaft base (anchor or breakaway) to be used is specified in the contract.

The shaft base plate must be a one-piece plate circumferentially welded to the shaft for anchor and breakaway base types.

For anchor bases, the base plate must attach directly to the anchor bolts. Furnish each anchor bolt with 2 nuts and 2 washers for plumbing and raking the shaft.

For breakaway bases, the plate must be attached to a breakaway device that attaches to the anchor bolts.

Use breakaway bolt couplings unless they do not function with the approved luminaire standard. The bolt coupling must meet the AASHTO LRFD *Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals* requirements.

Use frangible transformer bases where bolt couplings cannot be used. Transformer bases must have an access door, grounding lug, and factory-made shims for plumbing. Provide each anchor bolt with one nut and one washer.

Furnish 4 high strength steel anchor bolts with each shaft. Furnish anchor bolts with a minimum 6 inches (150 mm) of the bolt threaded at the top. Size the anchor bolt in accordance with the shaft manufacturer's recommendations.

Anchor bolts used with breakaway bolt couplings must project out of the foundation the length recommended by the coupling manufacturer. Furnish the breakaway bolt coupling, washer, nut and bolt covering that enclose the area between the base plate and foundation.

Anchor bolts used with transformer bases must project at least 3 inches (75 mm) from the foundation.

Provide a mounting base where the mast arm connects to the shaft. Provide an opening in the base for running wire from the shaft to the mast arm.

All accessories welded to the shaft must be factory-welded before galvanizing.

703.04.3 type 2 and 3 Signal Standards

Furnish a single steel section shaft formed into a round, continuous taper with a single, automatic electrically welded seam, or an approved equal.

Show the type of steel used for the shafts on the shop drawings.

Furnish 4 high strength steel anchor bolts with each shaft. Furnish each anchor bolt with 2 nuts and 2 washers over and under the shaft base to adjust rake and plumb.

All accessories welded to the shaft must be factory welded before galvanizing.

Furnish rain tight metal covers for the top of Type 2A and 3A signal standards.

703.04.4 Type 10 Luminaire Standards.

Shafts must be a single section formed into a round, continuous taper with a single, automatic electrically welded seam, or approved equal. Steel shafts must be a minimum No. 11 Manufacturers Standard Gauge.

Show the type of steel on the manufacturer's shop drawings.

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Furnish rain-tight metal covers for the top of each shaft.

Shafts not mounted on transformer bases must have a handhole with removable cover and an internal grounding lug, as shown in the contract. Locate the handhole in the same quadrant as the mast arm.

Shafts mounted on transformer bases do not require a handhole or grounding lug.

The shaft base (anchor or breakaway) to be used is specified in the contract.

The shaft base plate must be a one-piece plate circumferentially welded to the shaft for anchor and breakaway base types.

For anchor bases, the base plate must attach directly to the anchor bolts. Furnish each anchor bolt with 2 nuts and 2 washers for plumbing and raking the shaft.

For breakaway bases, the plate must be attached to a breakaway device that attaches to the anchor bolts.

Use breakaway bolt couplings unless they do not function with the approved luminaire standard. The bolt coupling must meet the *AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals* requirements.

Use frangible transformer bases where bolt couplings cannot be used. Transformer bases must have an access door, grounding lug, and factory-made shims for plumbing. Provide each anchor bolt with one nut and one washer.

Furnish 4 high strength steel anchor bolts with each shaft. Furnish "L" shaped anchor bolts with a minimum 6 inches (150 mm) of the bolt threaded at the top. Size the anchor bolt in accordance with the shaft manufacturer's recommendations.

Anchor bolts used with breakaway bolt couplings must project out of the foundation the length recommended by the coupling manufacturer. Furnish the breakaway bolt coupling, washer, nut and bolt covering that enclose the area between the base plate and foundation.

Anchor bolts used with transformer bases must project at least 3 inches (75 mm) from the foundation.

Provide a mounting base where the mast arm connects to the shaft. Provide an opening in the base for running wire from the shaft to the mast arm.

All accessories welded to the shaft must be factory-welded before galvanizing.

703.04.3 Mast Arm - Signal and Luminaire

Traffic signal mast arms up to 50 feet (15.2 m) in length must be single tapered members. Traffic signal mast arms over 50 feet (15.2 m) long may be two-piece tapered members.

Luminaire mast arm ends must have a 2-inch (50 mm) slip-fitter tenon at least 6 inches (150 mm) long. Attach or form the end of the luminaire mast arm to a 2-inch (50 mm) pipe size slip-fitter tenon a minimum of 6 inch (152 mm) in length.

All accessories welded to the mast arm must be factory-welded before galvanizing.

Mast arm lengths and mounting heights are shown in the contract.

703.04.4 Welding Steel

Meet the requirements of Section 624 and the following.

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Ensure that all **NDT** is performed by personnel qualified in conformance with the American Society for Nondestructive Testing Recommended Practice *No. SNT-TC-1A* to minimum Testing Level II for the individual methods. Provide ASNT certifications and procedures before testing. Denote the WPS identification in the tail of the weld symbol for all welds shown on the shop drawings.

Visually inspect 100% of all welds.

Meet all the applicable AASHTO and AWS welding inspection requirements including those modified as follows:

2.5. Circumferential Weld Splices. Use full-penetration (i.e., complete-penetration) groove welds for pole and arm sections joined by circumferential welds. Perform radiographic testing or ultrasonic testing as approved by the Project Manager meeting AWS D1.1, Structural Welding Code, Section 6. No repair of circumferential welds is authorized without written approval by the Department.

3.6. Longitudinal Seams. Longitudinal seam welds for pole and arm sections must have 60% minimum penetration, except for the following areas:

a)c) Provide full penetration groove welds for longitudinal seam welds within 6 inches of circumferential welds.

b)d) Provide full-penetration longitudinal seam groove welds for a length equal to the minimum splice length authorized on the female section of telescopic (i.e., slip type) field splices.

Inspect 100% of all full penetration groove welds using radiography or testing may be by ultrasonic test methods AWS D1.1, Structural Welding Code Ultrasonic, Section 6, both above test methods to be approved by the Project Manager before use.

Randomly test 25% of all partial penetration welds and fillet welds per component using magnetic particle test methods.

4.7. Base Connection Welds. Inspect 100% of full-penetration groove welds by nondestructive methods of radiography or ultrasonics approved by the Department's Bridge Bureau.

Inspect 25% of all fillet welds per assembly, by Magnetic Particle (MT) methods.

5.8. Fillet Welds/Attachment Welds. Inspect 25% of all fillet welds per assembly, by Magnetic Particle (MT) methods.

703.04.8 Inspection

a)c) Visual Weld Inspectors. Inspections are to be performed by **a CWI.**

b)d) Nondestructive Testing. All personnel performing NDT must be currently certified in accordance with the American Society for Nondestructive Testing (ASNT) to a Level II certification.

Perform non-destructive testing at no cost to the Department.

The Contractor must furnish all labor, equipment, and material necessary to provide the Department inspector access to the poles.

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Standards may be inspected at the point of fabrication and will be inspected upon delivery. Where inspection reveals defects in structural adequacy, quality, or workmanship, repair the pole shaft, signal mast arm, luminaire extension, luminaire mast arm or mounting hardware to the sole satisfaction of the Department at no cost.

If after a second inspection, the same defects are present that were revealed in the first inspection, the component that is defective will be rejected. Refabricate all rejected components. The Department will pay all QA inspection costs involved in the first inspection. All other costs, both for material and inspection after the first inspection, are the responsibility of the contractor.

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704.1.8 Overhead Structures

Furnish overhead sign structures in accordance with AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals*, including fatigue requirements in Section 11.

Include fatigue design requirements for all sign structures as follows:

Table 704-X
Sign Structure Design Requirements

<u>Design Wind</u>	<u>700 MRI basic wind speed (115 MPH)</u>
<u>Gust Factor Effect (G)</u>	<u>1.14</u>
<u>Height and Exposure Factor</u>	<u>K_z, where $\alpha = 9.5$; z_g = 900 ft. for exposure C</u>
<u>Deflection</u>	
<u>Cantilevered Sign Supports</u>	<u>Free end of arm max. deflection (8 inches)</u>
<u>Sign Bridge Structures</u>	<u>Horizontal chord max. deflection (8 inches)</u>
<u>Design Area</u>	<u>Design area with respect to max wind load is perpendicular to the structure.</u>
<u>Design Weight</u>	<u>Dead Load and ice</u>
<u>Fatigue Category</u>	<u>1</u>

Include Galloping, Truck Induced Gusts (Use posted speed limit) and Natural Wind Gusts
Design life: 50 years

- Fatigue Category: 1
- Galloping: cantilevered structures only
- Truck Induced gusts: posted speed limit
- Natural wind gusts

REASON: Standard Special - Traffic

COMMENTS: MDT comments received

Final: shown on following page

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Final Acceptance

704.1.8 Overhead Structures

Furnish overhead sign structures in accordance with the most current edition of AASHTO **LRFD** *Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals*, including fatigue requirements in Section 11.

Include fatigue design requirements for all sign structures as follows:

Table 704-X
Sign Structure Design Requirements

Design Wind	700 MRI basic wind speed (115 MPH)
Gust Factor Effect (G)	1.14
Height and Exposure Factor	Kz, where $\alpha = 9.5$; $z_g = 900$ ft. for exposure C
Design Area	Design area with respect to max wind load is perpendicular to the structure.
Design Weight	Dead Load and ice
Fatigue Category	1

Include Galloping, Truck Induced Gusts (use posted speed limit) and Natural Wind Gusts.

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704.01.10 Retro-reflective Sheeting

A. General. Furnish ~~the type of retro-reflective sheeting and color specified in the contract~~ ASTM D4956 Type XI retro-reflective sheeting for all signs unless otherwise shown in the contract.

1. Delineators. Furnish ASTM D4956 Type IV retro-reflective sheeting for all reflectors and panels.

~~1. Traffic Control.~~

2. Use Furnish traffic control sheeting in accordance with ASTM retro-reflective sheeting on the traffic control devices specified in Table 704-3.

The following traffic control devices in the traffic control rate schedule require ASTM designated retro-reflective sheeting as specified. Provide orange sheeting that is fluorescent. All other sign colors need not be fluorescent:

TABLE 704-3

ASTM RETRO_REFLECTIVE SHEETING REQUIREMENTS

Traffic Control Rate Schedule Group No.	Specification	Type
1-15 <u>12</u> , 19, 25 (panel) and all other work zone sign faces (e.g., flag person paddles, pilot car signs, etc.)	ASTM D4956	XI, X, IX VIII, VII or VI
27, and all cones and tubular markers	ASTM D4956	III or V
13, 14, <u>17, 27</u>	ASTM D4956	IV or higher

~~C.B.~~ Letters – Direct Applied. No Changes

C. Digitally Printed Signs. Digitally printed signs may be used if they meet the following requirements:

1. Submit the manufacturer’s certificate of compliance a minimum of 14 calendar days prior to sign installation. The certification of compliance must certify that the equipment, materials, operators, and processes have been certified by the sheeting manufacturer.

2. Digitally printed ink systems must meet ASTM D4956 color standards.

3. Follow the sheeting manufacturer’s quality control process during the manufacturing process.

4. Apply a clear UV protective overlay to the entire sign face. Ensure the overlamine complies with the retroreflective sheeting manufacturer’s recommendations.

5. Furnish black inks that are entirely opaque.

6. Furnish signs free of printing lines. Ensure inks are homogeneously applied.

7. Store, handle, and transport signs in accordance with the manufacturer’s recommendations to prevent damage to the sign.

D. Acceptance. No Changes

REASON: Standard Special

COMMENTS: Comments received. MCA commented on Table 704-3 changes and stressed that those changes would make their inventory obsolete. MDT agreed and the changes were proposed with the understanding that contractors could not purchase NEW signs with the other sheeting types. MDTs intent was too not prohibit current inventories and so this requirement will not be implemented. The subsection was reorganized to help

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clarify the requirements. No other comments were received on the sheeting changes or the addition of the specials.

FINAL Acceptance

704.01.10 Retro-reflective Sheeting

Furnish ASTM D4956 Type XI retro-reflective sheeting for all signs.

- A. Delineators.** Furnish ASTM D4956 Type IV retro-reflective sheeting for all reflectors and panels.
- B. Digitally Printed Signs.** Digitally printed signs may be used if they meet the following requirements:
 1. Submit the manufacturer's certificate of compliance a minimum of 14 calendar days prior to sign installation. The certification of compliance must certify that the equipment, materials, operators, and processes have been certified by the sheeting manufacturer.
 2. Digitally printed ink systems must meet ASTM D4956 color standards.
 3. Follow the sheeting manufacturer's quality control process during the manufacturing process.
 4. Apply a clear UV protective overlay to the entire sign face. Ensure the overlamine complies with the retroreflective sheeting manufacturer's recommendations.
 5. Furnish black inks that are entirely opaque.
 6. Furnish signs free of printing lines. Ensure inks are homogeneously applied.
 7. Store, handle, and transport signs in accordance with the manufacturer's recommendations to prevent damage to the sign.
- C. Letters - Direct Applied.** Furnish letters, numerals, symbols, and borders from Type III sheeting, permanently adhered to the sign face reflective sheeting.

Apply the letters, numerals, symbols, and borders following the sheeting manufacturer's recommendations. Follow the size, series, and spacing in the FHWA's *Standard Alphabets* proportion and spacing requirements.

Use finished pieces that are clean cut, free of ragged borders.
- D. Traffic Control.** Furnish traffic control sheeting in accordance with ASTM retro-reflective sheeting on the traffic control devices specified in Table [704-3](#).

The following traffic control devices in the traffic control rate schedule require ASTM designated retro-reflective sheeting as specified. Provide orange sheeting that is fluorescent. All other sign colors need not be fluorescent:

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TABLE 704-3

ASTM RETRO_REFLECTIVE SHEETING REQUIREMENTS

Traffic Control Rate Schedule Group No.	Specification	Type
1-15, 19, 25 (panel) and all other work zone sign faces (e.g., flag person paddles, pilot car signs, etc.)	ASTM D4956	XI, X, IX VIII, VII or VI
27, and all cones and tubular markers	ASTM D4956	III or V
17	ASTM D4956	IV or higher

Reflective sheeting may only be overlaid on reflective sheeting of the same color. Remove any existing legend prior to overlaying.

E. Acceptance. Submit manufacturer's certification that the retro-reflective sheeting used meets the designated ASTM type retro-reflective requirement specified.

The Department may take sheeting samples for analysis and testing. The Project Manager may visually compare the sheeting's diffuse day color in the field using standard color charts and test the signs retro-reflectivity using a retro-reflectometer.

Replace rejected material at Contractor expense.

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710.02 TABLE 710-2

**TABLE 710-2
EPOXY PAINT FOR PIPE PILE REQUIREMENTS**

	Requirement
Drying Time at 75 °F (24 °C) To Touch To Cure	2 hours max. 10 days max.
Pot Life at 70 °F (21 °C)	12 hours min.
Abrasion resistance (ASTM D4060; CS-17 wheel, 1,000 Gram load, 1,000 cycles)	170 mg loss, max.
Direct impact resistance (ASTM D2794)	60 inch-pounds (6.8 N-m) minimum

REASON: *Test is not performed*

COMMENTS: *No comments received*

FINAL: ***No changes to the draft spec; publish as shown.***