

# Construction Manual

1998 Version

2001 Update

*February, 2001*

Page	Action	Description
TOC 100	<b>Add</b>	Added 103.32 and 103.33.
TOC 400	<b>Change</b>	Change page to find method of measurement.
TOC 500	<b>Change</b>	Change AC to Performance Graded Binder.
TOC 700	<b>Change/Add</b>	Add and renumber in 710.00 and add 704.05.
TOC 1000	<b>Add</b>	Added concrete strength table.
TOC 1200	<b>Change</b>	Format change.
TOC 1300	<b>Change</b>	Page numbering change.
1	<b>Change</b>	Change Director-State Engineer to Director.
2	<b>Change</b>	Change Operations to Engineering.
3	<b>Change</b>	Change and move. Moved Construction Manual and Specifications over to second column.
5	<b>Change</b>	Change Deputy State Engineer-Operations to Director.
7	<b>Change</b>	Change Materials and Tests to Materials and Research (2 places).
12	<b>Change</b>	There is no page 12a. Everything on 12a is now on page 12.
24	<b>Change</b>	Change OfficeVision to Lotus Notes.
26	<b>Add</b>	Add bullet list.
41	<b>Change</b>	Change Kale Vontz to Dan Necas
44	<b>Delete</b>	Take out – The Project Manager and.
47	<b>Add</b>	Add bulleted lists.
49	<b>Change</b>	Change Kale Vontz to Dan Necas.
52	<b>Change</b>	Capitalize Manager.
54	<b>Add</b>	Add paragraph E; Payrolls are requested thru FHWA.
54	<b>Change</b>	Part of the last paragraph is on page 55.
55	<b>Change</b>	Part of this paragraph is on page 54.
60	<b>Add</b>	Add Sections 103.32 and 103.33; use of Lotus Notes & letters to subs.
66	<b>Add</b>	Add clarification to Notice to Proceed date and add paragraph about Notice to Proceed date recorded in SiteManager.
67	<b>Add</b>	Add text on the working days in two paragraphs.
69	<b>Add</b>	Add information about what should be on Working Day Report.
69a	<b>Move</b>	Text from Page 69 moved to Page 69a.
74	<b>Add/Delete</b>	Add new paragraphs on Winter Work provisions. Deleted paragraph under Weekly Report of Working Days and replaced it with another.
80	<b>Add</b>	Add paragraphs; FHWA oversight.
81	<b>Add/Delete</b>	Add paragraph; FHWA oversight. Changed approval limits and deleted Department Director.
85	<b>Change</b>	Change paragraphs
94	<b>Change/Add/Delete</b>	Change Materials and Tests to Materials and Research. Added a comma and deleted “s” from Research under Assurance Sampling and Testing.

<b>Page</b>	<b>Action</b>	<b>Description</b>
99	<b>Delete/Add</b>	Delete old paragraph and add new paragraph. SM time extensions. Added to first paragraph under Contract Time Extensions.
100	<b>Delete</b>	Delete paragraph; DR-16 no longer required.
104	<b>Add/Change Delete</b>	Add new text and change Tests to Research (3 places). Change Xerox to make in first line and delete Xerox in second line. Add the word the under Field Notebooks.
108	<b>Change/Add</b>	Change Tests to Research and add new text.
109	<b>Change</b>	Change CAISE to GeoPak.
113	<b>Change</b>	Change Tests to Research.
114	<b>Change/Add</b>	Change CAISE to GeoPak. Change GeoPak to Microstation. Add a comma.
122	<b>Add/Change</b>	Add new paragraph; Site Releases for borrow. Combine last two paragraphs into one with changes.
125	<b>Add</b>	Add new paragraphs; Project completion – DR-91 guidance.
126	<b>Add</b>	Add new paragraph; Lotus Notes on project completion.
128	<b>Change</b>	Change Division to Section.
136	<b>Replace/Add</b>	Replace Paragraph 106.11; overrun/underrun letter. Add a comma.
137	<b>Add</b>	Added new paragraph on 2 <sup>nd</sup> tier subcontractor evaluations. Add a comma.
142	<b>Delete</b>	Deleted paragraph; Addition estimate obsolete.
151	<b>Change</b>	Change Tests to Research.
154	<b>Change</b>	Change Tests to Research and CACIE to GeoPak.
163	<b>Change/Add</b>	Change Tests to Research and take Nebraska out of address line. Add two commas and a 's' to Mechanic. Change unsuitable to unsuitably and add the word 'wet' two places. Delete the words 'is best' and add may be necessary.
164	<b>Add</b>	Added Nebraska Game and Parks Commission Approval of Borrow Sites.
165	<b>Change</b>	Change Borrow Pit/Material Pit Identification and Evaluation Figure 204.01.
170	<b>Add/Change</b>	Added Tentative Acceptance. Add two commas and change last sentence to two sentences.
177	<b>Change</b>	Change Tests to Research.
180	<b>Change</b>	Change Tests to Research.
181	<b>Add</b>	Add new paragraph; shoulder placement guidance.
208	<b>Change</b>	Change Highway Safety to Traffic Engineering.
209	<b>Change</b>	Change Highway Safety to Traffic Engineering.
212	<b>Add</b>	Add paragraphs; Flagger hard hat.
212	<b>Add</b>	Add paragraphs; pavement moisture prior to application of pavement marking.
214	<b>Change</b>	Change Tests to Research (2 places).
218	<b>Change</b>	Change Director-State Engineer to Director.
224	<b>Change</b>	Change Director-State Engineer to Director.
227	<b>Change</b>	Change AC to Performance Graded Binder and Tests to Research.
229	<b>Change</b>	Change AC to performance graded binder.
231	<b>Change</b>	Change AC to performance graded binder and subplot amounts.
232	<b>Change</b>	Change Tests to Research.
232a	<b>Add</b>	Add new paragraphs, asphalt guidance.

<b>Page</b>	<b>Action</b>	<b>Description</b>
233	<b>Change</b>	Change Tests to Research and AC to performance graded binder.
233	<b>Add</b>	Add new verbiage on binder.
234	<b>Change/Add</b>	Change Tests to Research (3 places) and AC to performance graded binder. Add the word 'The' in front of Plant inspector.
235	<b>Change</b>	Change Tests to Research. Change standard forms to will use NDR forms and delete some words.
236	<b>Change</b>	Change Tests to Research.
240	<b>Change</b>	Change Tests to Research.
242	<b>Change/Add</b>	Change verbiage and amounts, on asphalt lots. Add the word 'the' in front of contractor. Add sentence to the end of a paragraph.
243	<b>Change/Add</b>	Change Tests to Research. Add sentence to second bullet item.
244	<b>Change/Add</b>	Add text in two places, change Tests to Research (4 places) and change AC to performance graded binder.
245	<b>Change/Add</b>	Change and add new text on lap joint. Add the word 'the' in front of longitudinal.
246	<b>Add</b>	Add verbiage and moved paragraph from Page 247. Add a comma after bodies. Add '3 miles' in front of 5 km and put parenthesis around 5 km.
248	<b>Change/Add</b>	Change and add new text on asphalt sampling and change AC to performance graded binder.
250	<b>Change</b>	Change AC to performance graded binder.
251	<b>Change</b>	Change verbiage on lots and AC to performance graded binder.
252	<b>Add</b>	Add new sentence at end of paragraph on use of 10' straightedge and change AC to performance graded binder. Add 'The' in front of Contractor. Add and change verbiage to first paragraph.
253	<b>Change</b>	Change table, change Tests to Research (1 place) and change AC to performance graded binder.
255	<b>Change</b>	Change cement to performance graded binder.
256	<b>Add</b>	Add paragraphs on performance graded binder.
260	<b>Add</b>	Add paragraphs on disposition of millings.
264	<b>Change</b>	Change paragraph; water as finishing aid.
265	<b>Change/Delete</b>	Change Tests to Research. Deleted part of No. 9.
266	<b>Change</b>	Change water tight to one word.
270	<b>Change/Add</b>	Change Tests to Research (2 places) and add a hyphen in 7-day and 140-day.
272	<b>Change</b>	Change Tests to Research.
274	<b>Change/Add</b>	Change M & T to Materials & Research and add hyphen in 90-minute and add an ' in manufacturer's.
275	<b>Add</b>	Add a sentence at end of paragraph on subgrade trimming. Added commas to first paragraph.
278	<b>Add</b>	Add new paragraph for cement type.
281	<b>Change</b>	Change M & T to Materials and Research.
300	<b>Add</b>	Add sentence on joint moisture when sealing.
301	<b>Change</b>	Change Tests to Research (2 places), changed are to is (2 places) and change or to nor.
309	<b>Change</b>	Change Tests to Research and M&T to Materials & Research.
310	<b>Change</b>	Change Tests to Research.
311	<b>Add</b>	Add new paragraphs on PR concrete deductions.
316	<b>Change/Delete</b>	Change Tests to Research. Delete comma in first paragraph.

<b>Page</b>	<b>Action</b>	<b>Description</b>
318	<b>Add</b>	Add paragraphs 8.a., b. c., Pile Record e-mail.
321	<b>Change/Delete</b>	Change verbiage and delete one word; pile record.
322	<b>Delete</b>	Delete word White.
323	<b>Add</b>	Add paragraph to Placement Procedures
324	<b>Change/Add</b>	Change M&T to M&R (2 places). Adding to Number 1 in Field Construction Procedures.
329	<b>Add</b>	Add paragraph on pier footing gravel/rock.
331	<b>Add/Change</b>	Add comma after the word area. Changed unwatering to watering.
333	<b>Change/Add</b>	Change Bridge to Materials & Research and add paragraph under 703.00.
334	<b>Add/Delete</b>	Add AASHTO behind ANSI. Delete 'and Flux Cored Arc Welding (FCAW) from paragraph. Add two paragraphs to bottom of page. Delete the two paragraphs at bottom of page and added Pile Groups/Categories.
335	<b>Change</b>	Form RD 209 to M&R Pile Record spreadsheet and DCE to Qudus.
335d	<b>Change</b>	Put in 4 inches and ( ) around 100 mm and inserted usually 3 feet after limits. Added (1 m) after 10 feet.
336	<b>Change/Add</b>	Change F to 7.f. and add paragraph under 704.02. Add on to paragraph under 704.02. Add the word 'when' in front of certain.
348	<b>Change/Delete/Add</b>	Change Tests to Research (2 places). Delete 'at which' and replace with 'when'. Add a comma after ratio.
350	<b>Change/Delete</b>	Change lower case p to upper case P and delete A from RCA.
353	<b>Change</b>	Change Tests to Research.
367	<b>Change</b>	Change Tests to Research (4 places).
367a	<b>Add</b>	Add paragraphs on payment for plates and shapes.
368	<b>Change/Add</b>	Change Tests to Research. Added to last paragraph under 705.02.
371	<b>Change</b>	Change Tests to Research.
374	<b>Change/Add/Delete</b>	Change Tests to Research. Added 'is allowed'. Delete comma after plant. Changed the 1 to a 0.
376	<b>Change/Add</b>	Put SSHC Subsection 707.03 in italics.
378	<b>Change</b>	Change Tests to Research.
379	<b>Add</b>	Add 3 paragraphs on deck crack prevention.
380	<b>Change</b>	Change Tests to Research.
382	<b>Add</b>	Added (optional) or (required)
383	<b>Add</b>	Added (optional)
384	<b>Add</b>	Added (optional) or (required)
385	<b>Add</b>	Added (optional)
388	<b>Change</b>	Corrected concrete temperature requirements in cold weather and 48 hours to 5 days. Corrected sentence structure.
389	<b>Change</b>	Change Tests to Research. Change 48 hours to 5 days.
391	<b>Add/Change</b>	Add a space between 3 m. Add the word 'or' and move measurement to second line.
409a	<b>Add</b>	Add Seal Bridge Deck Cracks, 1. 2.
413	<b>Add/Change/Delete</b>	Add verbiage in first paragraph and change Tests to Research (3 places). Delete verbiage that was added. Add sentence to the end of the first paragraph.
413a	<b>Change</b>	Change Tests to Research (2 places). Changed capital p to a lower case p.
414	<b>Change</b>	Change Tests to Research (2 places).

<b>Page</b>	<b>Action</b>	<b>Description</b>
416	<b>Change</b>	Change Tests to Research.
418	<b>Add/Change</b>	Add in new sections on culvert backfill & construction and change numbers to others. Added to paragraph See Section 706.02. Added verbiage to last paragraph.
418a	<b>Change</b>	A portion of this page was moved from Page 418.
418b	<b>Change</b>	Text moved from 418a to this page.
422	<b>Change</b>	Change Tests to Research.
424	<b>Add</b>	Add Temporary Culvert Pipe section and salvaged culverts.
437	<b>Add</b>	Add paragraphs about Erosion Control.
444	<b>Add</b>	Add paragraph on seed measurements.
452	<b>Add</b>	Add No. 7 under General Comments and change 7. to 8.
466	<b>Change</b>	Move the English length to the front of the Metric length. No. 9, change 'right' to 'correct' and No. 11, change 'right' to 'correctly'.
468	<b>Change</b>	Change Tests to Research.
471	<b>Add</b>	Add section on Guardrail Post & ET-2000 Plus head.
477	<b>Change</b>	Change Tests to Research.
478	<b>Change/Delete</b>	Change verbiage and delete paragraphs. Change produced to product.
479	<b>Delete/Change</b>	Delete paragraphs and change Tests to Research (2 places).
480	<b>Change</b>	Change Tests to Research.
481	<b>Change</b>	Change Tests to Research (4 places).
481a	<b>Add</b>	Add 1003.05.
486	<b>Change</b>	Change NDR to DEQ.
490	<b>Change</b>	Change environmental to environment.
494	<b>Change</b>	Change DEC to DEQ and change Control to Quality.
528	<b>Change/Add/Delete</b>	Page 528a becomes Page 528 and change Tests to Research. Added Jeff Kisicki under District Trainers and deleted Darin Brown. Changed extension to 1910. Deleted Noel Salac under Resident Trainers.
528a	<b>Change</b>	Page 529b becomes Page 528a and change Tests to Research (2 places).
531 & 531a	<b>Add/Delete</b>	Add table under 1300.01 and move 1300.02 to Page 531a. Add a bullet paragraph and delete a bullet paragraph. Delete a bullet paragraph.
1-1	<b>Add</b>	Added DR 74
1-16a	<b>Add</b>	Added DR 74
4-5	<b>Change</b>	Changed conversion factors.
4-6	<b>Change</b>	Changed conversion factors.

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## DIVISION 500

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## DIVISION 700 BRIDGES, CULVERTS & RELATED CONSTRUCTION

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## DIVISION 100

### CONTRACT ADMINISTRATION & INSPECTION PROCEDURES

#### 101.00 -- CONSTRUCTION ORGANIZATION

##### 101.01 PURPOSE OF MANUAL

- Establish uniform policies and procedures for contract administration and inspection of construction projects, and provide interpretation and clarification of specifications.
- Serve as a collecting point for new instructions and guidelines relating to administration and inspection of construction projects.
- Describe the role of District Engineers, District Construction Engineers, Project Managers, Construction Technicians, and others assigned to supervise and inspect construction projects.

##### 101.02 ENGINEER'S DUTIES AND AUTHORITY

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###### I. Authority of the **Director**

- A. General - The specifications are the Engineer's authority to decide questions as to quality or acceptability of material furnished, work performed, manner of performance, rate of progress of the work, and interpretations of the plans and specifications.

The authority exercised by the Engineer as provided in *SSHC Subsection 104.02 and Subsection 105.01* includes the following:

1. Authority to enforce specific requirements and provisions of the plans and specifications.
2. Authority to interpret the requirements and provisions of the plans and specifications in cases of questionable or doubtful application.
3. Authority to authorize (approve) revisions or modifications in the plans or specification requirements and/or to authorize or establish new or additional plans or specification requirements.
4. Authority to suspend the work under certain conditions.

###### B. Delegation of Authority

General - The **Director**, exercising the responsibilities given him/her by the statutes regarding the control, management, supervision, administration, and direction of the Department of Roads, assigns and designates to various engineering, management, and technical

@

personnel the responsibility for the performance of certain functions of the highway construction operations.

The assignment and designation of responsibility for the performance, supervision, or completion of any task by this Construction Manual also includes the authority necessary to complete that task.

### **101.03 CONSTRUCTION DIVISION**

The Construction Division is the eventual authority for all your unresolved contract and construction related questions. It provides:

- Direction and consultation to District Engineers, Construction Engineers, Project Managers, Construction Technicians, and other central offices relating to specifications, methods, techniques, and policies on highway construction, inspection, and contract award and administration.
- Final decision capability for all disputes or questions regarding contract administration.

@ The Construction Engineer is directly accountable to the Deputy Director for **Engineering**. The organizational chart for the Construction Division is shown in Figure 101.1.

Responsibility for administering construction contracts on the roads, highways, and interstate systems rests with the Construction Engineer. Responsibility for actual construction work is delegated to the District Engineer and ultimately rests with the Project Manager.



# Construction Division

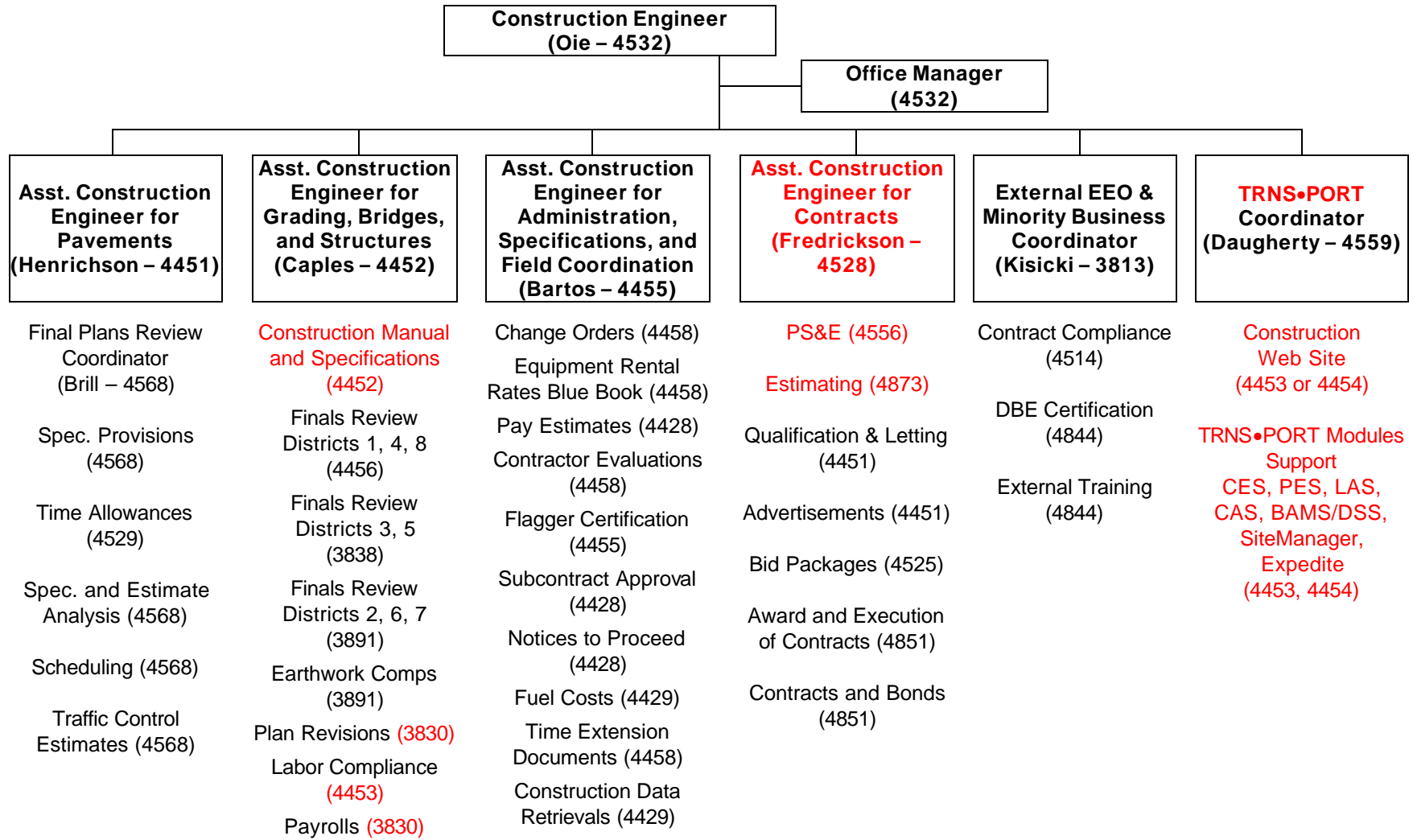


Figure 101.

**101.06 DISTRICT ENGINEER (DE)**

@ The District Engineer is responsible to the **Director** for the proper administration and completion of each contract for highway construction in his/her District.

The District Engineer has the responsibility and the authority to:

- a. Manage the field staff that provides construction and materials inspection on highway projects within each NDR District. This responsibility includes oversight on contract administration issues, compliance of materials, quality of work performed, and approval of most change orders.
- b. Enforce specific requirements of the plans and specifications in the completion of contracts for highway work. (Generally, he/she will actually delegate this responsibility and authority to the Project Manager.)
- c. Interpret or rule on disputes over requirements of the plans and specifications and decide questions which may arise in all cases when such interpretations and decisions will result in completion of the work in accordance with the intent of the plans and specifications.
- d. Prepare and recommend revisions and modifications in the requirements or provisions in the plans or specifications, or prepare and recommend additional requirements in cases where construction conditions appear to warrant revisions or additional requirements. See *SSHC Subsection 104.02* for alterations which can be approved by the District Engineer.
- e. Delegate the direct responsibility for the engineering supervision and inspection at the project level, generally through the District Construction Engineer to Project Managers in the field.

DEs also provide field input into construction related problems for process improvements. It is imperative that DEs maintain a close working relationship with all central offices.

**101.07 DISTRICT CONSTRUCTION ENGINEER (DCE)**

The DCE is responsible for management of the field staff that provides construction and materials inspection on highway projects within each NDR District. This responsibility includes oversight on contract administration issues, compliance of materials, quality of work performed, and approval of most change orders. DCEs also provide field input into construction related problems for process improvements. It is imperative that DCEs maintain a close working relationship with all central offices. The DCEs report to the DE.

The District Construction Engineer is responsible directly to the District Engineer for the direct and close supervision of the construction work and the supervision of Project Managers at the project level, as assigned to him/her by the District Engineer.

In cases of questionable application of plan or specification requirements, the Project Manager may decide such questions or make interpretation of specification requirements if the decision or interpretation will clearly result in the completion of the work in accordance with the intent of the plans and specifications.

If the intent of the plans or specifications is not clear or a dispute over interpretation of plan or specification requirements develops, or if the provisions are clearly unworkable or impractical, the Project Manager shall submit the question or problem to the District Construction Engineer or District Engineer for determination.

If an immediate decision must be made, or question resolved, and the District Engineer or the District Construction Engineer is not available, the Project Manager is authorized to contact and consult the Construction Engineer or the appropriate Assistant Construction Engineer who will, if required, contact the appropriate division engineer concerned (Design, Bridge, Materials and **Research**, or Right of Way) for a determination. Exceptions to the foregoing are questions considered routine in nature concerning materials, in which case the Materials and **Research** Division may be contacted directly.

@

### **Delegation of Responsibility**

The Project Manager cannot and should not expect to retain all the duties and responsibilities assigned. In an efficient organization, each employee should be delegated authority in line with their responsibilities and duties. The Project Manager must check to see that duties delegated to the Construction Technicians are properly performed.

Responsibility for inspection and surveying on a project should be delegated to one or more experienced employees. This includes the responsibility for documentation of quantities and administrative work necessary for preparation of the final estimate. Inspectors must have authority to direct and coordinate activities of inspection or survey personnel assigned to them.

All employees should be encouraged to accept delegated responsibility and to make decisions within the authority delegated to them.

### **101.09 CONSTRUCTION TECHNICIAN (CT)**

Construction Technician must review and understand the Plans, Special Provisions, Specifications, utility agreements, railroad agreements, and municipal/county agreements. A CT will be assigned to monitor or inspect specific construction operations by the Project Manager. The CT will be responsible for and directly accountable to the Project Manager for the proper performance of the task assigned.

The CT has the authority to inspect all work performed and materials furnished and to enforce all specific requirements of the plans and specifications involved in the operations to which he/she is assigned.

In cases of questionable application of plan or specification requirements to the work in progress, and if an immediate decision is needed, the CT should, if the CT judges the intent of the requirement to clearly warrant a reasonable interpretation, make such an

beams, samples of aggregates or other materials, and the products of project site clearance.

Complete cleanup of the construction area or plant site, including test materials, is the responsibility of the contractor.

#### **102.04 PRESENCE ON SITE**

As the Department's representative on the project, it is essential that the Project Manager be available at all times to the contractor, his/her subordinates, and the supervisor. The PM should never be absent from the job without his/her whereabouts being known to someone, so that he/she may be contacted if necessary. The Project Manager's absence from the project will certainly compromise his/her efficiency and can be most embarrassing to his/her superiors.

#### **102.05 PLANS AND WORKING DRAWINGS (SSHC 105.02)**

"All authorized alterations affecting the requirements and information given in the approved plans shall be in writing". Such alterations will generally be authorized by revised plans, and the Project Manager should only authorize alterations on that basis.

#### **102.06 PLAN ERRORS/OMISSIONS**

The Project Manager, upon discovering or suspecting an error or omission in the plans, will immediately send an e-mail note to the District Construction Engineer and the Construction Division in Lincoln. The note should provide all available information. This would include:

- A description of the problem and reasons for concluding a plan error or omission.
- The sheet number(s) where the error is located.
- What alternatives are available.

The Construction Division will contact the Section Head responsible for the work where the error or omission is suspected and determine if a problem exists.

- For consultant designed plans, the Section Head must notify the consultant and Project Development's Agreement Engineer if a problem with the plans exist.
- The consultant must be included immediately in the discussion and resolution of the problem. They may have a workable and less costly solution.

The final solution to the error or omission will be an agreed joint decision by the Construction Division, the District, and the responsible Section Head, and the consultant (when applicable).

For consultant designed plans, the District must send the Agreements Engineer a signed copy of the "Contractor Change Order/Supplemental Agreement."

@ *(There is no page 12a)*

## 102.16      **DETOUR REPORT**

During the construction season, detour and shoofly maps are prepared every month to show roads closed for construction or under construction but open to traffic with restrictions. You should forward information for these maps to the Communication Division via **Lotus notes** by the 20th of each month.

@

The District Engineer or his/her representative is responsible for identifying when project work will begin and end, restrictions in vertical and horizontal clearance through the work zone, and other information identified on the Detour Report. *It is extremely important that the information provided be current and accurately represent all traffic restrictions and detours in effect.* This information should be reported as soon as the construction schedule is known so the information is available for Motor Carriers when applying for truck permits.

## 102.17      **CONTROL NUMBERS AND CONTRACT NUMBERS**

DOR-OI 10-2 requires that, with the exception of letters for the Governor's signature, correspondence relating to a specific highway project will include the project number, location, and control number.

## 102.18      **PROJECT DOCUMENTS DISPOSITION**

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### **Contract Compliance Review**

FHWA Form 86 Case File of review to determine compliance with equal employment opportunity and affirmative action contract requirements. Kept in EEO for one year from the compliance review, then sent to Archives. Dispose of after three years of receipt in Archives.

### **Contract Payrolls**

Salaries and wages paid to individual employees of contracting firm that receives low bid awards. In Construction Office for varying lengths of time depending on FHWA. Stored on the Hill for three years. Dispose of three years after FHWA has paid off.

### **Contract Records**

Including the following: prequalifying prospective bidders, qualifying low bidders, advertising of bids, engineer's estimates, awards of contract and concurrences, agreement estimates, anti-collusion, certifications for force account construction, award and execution correspondence, letting information (such as plan orders, etc.), and any similar records considered necessary to document the contract. Retain two years plus current year in Contracts Office – to Archives – microfilm annually and destroy original, security microfilm, transfer to security storage; dispose of after 25 years.

- Utility requirements (*SSHC Subsection 105.06*).
- Erosion Control Plans
- Contractor's plan and schedule of operation (*SSHC Subsection 108.07*).
- Type and adequacy of equipment.
- No materials are to be incorporated in the project until approved by the PM. All electrical materials must be approved by the Construction Division before any electrical work begins.
- Material Suppliers
- Sources of labor and labor requirements.
- Maintenance of traffic and business access.
- Other pertinent items that will result in a better job understanding.
- Partnering opportunities.

@

#### **103.02 ADMINISTRATION DETAILS**

Before discussing any project details, Subsections 103.00 to 103.61 of the *Construction Manual* may be distributed to the contractor and subcontractors at the Project Manager's option.

Administrative issues to be discussed at the preconstruction conference include:

##### **A. Change Orders**

Before commencing any work not covered by the contract, the contractor and the Project Manager must agree on the price or prices to be paid for the work (or the method used to determine them). Extra work performed before this agreement is reached cannot be considered for payment. The basis of payment for the cost of extra work follows four general categories:

- Contract unit prices
- Agreed unit prices
- Agreed total prices
- Force account

On force account work, the contractor is required to prepare payrolls and invoices, in duplicate, for labor, equipment and material furnished, using a "Force Account Agreement" (DR Form 58). This form shall be signed by the inspector and contractor's representative at the end of each day's work. Both the contractor and inspector will retain a copy.

##### **B. Contract Documents**

Contractors must see that copies of plans, specifications, and special provisions are available at all times to their representatives on the project.

b. State Funded Contracts

State Poster - Equal Opportunity Commission  
WH-1420 - Your Rights under the Family and Medical Leave Act 1993  
WH-1462 - Notice: Employee Polygraph Protection Act  
USDOL-1088 - Your Rights - Federal Minimum Wage

Examples are included in *Appendix 2*. Additional copies, if needed, can be obtained from the Project Manager or the Construction Division (Mr. Dan Necas, 4453). In addition to postings noted above, a copy of the Policy Statement shall be posted.

All required site postings shall be in a location that is easily accessible to all employees. They may be fastened to a bulletin board, tool shed, or job office trailer and protected from weather by glass or clear plastic. Postings that become soiled, faded, or otherwise illegible should be replaced. More than one posting may be necessary if there are multiple locations where workers report for work. Such cases typically occur on complex or long projects involving several different crews and/or subcontractors.

**103.22 OCCUPATIONAL SAFETY AND HEALTH**

Occupational Safety and Health Act (OSHA) regulations (federal and state) apply to all construction projects. (Federal OSHA regulations are codified in *29 CFR, Sections 1910 and 1926*.) Contractors are responsible for compliance with OSHA regulations and shall maintain a safe work site. Therefore, contractors and their employees must be familiar with the health and safety requirements of the act.

- As an employer, contractors are required to keep employee occupational injury and illness records at the location where their employees usually report for work. The "Log and Summary of Occupational Injuries and Illnesses" (OSHA Form 200) must be completed within six days following a recordable occupational illness or injury. A copy of the completed form must be maintained at the work site. In addition, OSHA Form 200 is to be completed at the end of each calendar year and posted at job sites before February 1. Detailed instructions are printed on the back of each form.
- A poster entitled "Safety and Health Protection on the Job" must be displayed in a prominent place at all times.

Contractors can obtain OSHA forms and posters from:

Regional Director-OSHA  
Federal Office Building  
Lincoln

or Administrative Safety & Labor Standards  
Division  
Department of Labor  
Lincoln

2. Construction Contracts and Subcontracts \$10,000 and Less

An EEO project site inspection is not necessary for these construction contracts.

3. Maintenance Contracts

On maintenance contracts, an EEO project site inspection is not necessary regardless of contracted amount.

4. Complaints of EEO Violations

The Project Manager will initiate an investigation into complaints of EEO violations. Investigations which substantiate violation allegations shall be reported to the Construction Division's EEO Section.

**103.24 TRAINING & TRAINEE PROGRAMS**

**Contractor's Responsibility**

1. Training Program

All prime contractors and subcontractors (with contracts over \$10,000) must develop, or have, an approved training program in accordance with the *Specifications*. **The Contracts Office (EEO Section) approves these programs** and can be contacted [(402) 479-4514] for answers to questions or assistance in developing an approved program.

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Shortly after a contract is awarded, the Contracts Office will verify that the successful bidder has an approved training program on file. If not, the contractor will be advised that a formal training program must be approved by the Contracts Office within 30 days. Failure to submit a training program will be considered noncompliance with the *Specifications*. A contractor who does not comply may be refused bidding proposals for future lettings until requirements for a training program are met. (Typically, contractors adopt and use the Associated General Contractors' (AGC) training program. It is acceptable in Nebraska.)

An acceptable training program shall include information covering:

- Method of trainee recruitment.
- Crafts to be trained and upgraded.
- Number of expected trainees per year and what part of total will be female, minority, and disadvantaged.
- Training procedures, including approximate training time.
- Commitment for keeping up-to-date records to summarize total time each trainee is trained in each classification.



- Other training deficiencies are noted during the inspection.

It is the Construction Division's responsibility to work with the Project Manager and contractor to rectify noted discrepancies. If after a reasonable time a contractor fails to meet training requirements or ignores requests for corrective actions, the Construction Division, working through the Project Manager, may request suspension of work until corrective action(s) are implemented. Suspending work will be used as a last resort. However, the offending contractor's bidding ability on future contracts could be restricted until such time that compliance with training is demonstrated.

2. Wage Rates

Wage rate interviews may also be completed during the EEO inspection.

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- Interviews should be conducted a minimum of every six months for each contractor and subcontractor.
- Projects whose duration is less than six months should have one interview with each contractor and subcontractor.
- Each District must keep interviews on file for three years.

3. Reports

a. "Reimbursable Trainee Training Record"

Shortly after a letting, the Contracts Office (EEO Section) will prepare and forward a letter listing projects that require a "Special Training Provision Monthly On-Job-Training Report" (Form 298) along with a supply of these forms.

Monthly, the contractor will be sending one completed Form 298 for each trainee employee until training for that employee is completed or terminated. The Project Manager will review, initial, copy, and forward the original Form 298 to the Construction Division, EEO Section. The copy will be placed and retained in the project file.

- b. Occasionally, contractors train employees on contracts that do not have a line number for trainee reimbursement. In this case, Project Managers are not responsible for monitoring that program and Form 298 is not required.

**103.25 WAGES AND EMPLOYMENT**

- A. In order to comply with the requirements of the Freedom of Information Act regarding protection of personal privacy, all requests for access to certified payroll records shall be forwarded to the Construction Division. Requests must be in writing, and if not made on behalf of an individual, the request must indicate the name of the organization making the request.
- B. Access to or copies of payrolls shall not be permitted until authorization has been received from the Construction Division. (Adherence to these procedures during investigation by the Department of Labor or FHWA is not required.)

2. These regulations are required by State law, but often are duplicated or made more restrictive by Federal laws.
3. *SSHC Section 110* refers to State law restrictions of hours and labor. This would include the State Fair Labor Standards Law which is cited in the Special Provisions in each State-funded project and requires the contractors to comply with such a scale of wages and conditions of employment as are paid and maintained by at least 50 percent of the contractors in the same business or field of endeavor. Contracts for State-funded projects do not contain an established scale of minimum wage rates; however, no wages paid can be below the minimum wage of the Fair Labor Standards Act. Questions which arise concerning the payment of proper rate should be referred to the District Office, or to the Construction Division (Mr. **Dan Necas**, 4453).

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### **103.26 DAVIS-BACON AND RELATED ACTS REQUIREMENTS (Payrolls)**

#### **A. General Information**

1. On selected contracts containing Federal-aid funds, Federal laws (Davis-Bacon Act) and regulations require the Secretary of Labor to issue a determination for minimum wage schedules to be included in each of these Federal-aid contracts. Special instructions to the contractors are issued by the Construction Engineer prior to the construction operations. A copy of the current instructions are available in *Appendix 2* (FHWA Forms) under Form WH 348, "STATEMENT OF COMPLIANCE."
2. Project Managers or their assistants shall conduct wage rate interviews (Report of Labor Compliance Interviews DR Form 98) on the selected Federal-aid projects in order to determine whether contractors and subcontractors are properly classifying employees and are complying with the minimum wage rate requirements of the Special Provisions.
3. The Project Manager is to make systematic spot interviews with the contractor's or subcontractor's employees when he/she feels it is necessary. As a matter of courtesy, the contractor's superintendent or foreman should be advised that personal interviews with employees will be made. The Project Manager shall select the employees to be interviewed and these should be of different payroll classifications if possible.
4. The number of different employees and classifications to be interviewed shall be at the discretion of the Project Manager to ascertain compliance with these requirements. If violations are discovered, the frequency and number to be interviewed shall be increased and corrective action taken until such violations have been eliminated. Depending on the size of the crews, an attempt should be made to avoid repeating interviews with the same individuals.

3. The Project Manager should check the payrolls for:
  - a. The employee's full name, mailing address, and Social Security number. (The employee's Social Security number need only appear on the first payroll on which his/her name appears. The employee's mailing address need only be shown on the first submitted payroll on which the employee's name appears, unless a change of mailing address necessitates a submittal to reflect the new address.)
  - b. Each classification, title, and equipment capacity rating must be verified to assure that they are the same (or recognizable abbreviation) as listed in the Contract Wage Rate Decision Schedule, with no deviations permitted.
  - c. Each employee's hourly rate must be verified and checked with a red pencil mark indicating that at least the minimum hourly rate and correct overtime rate has been paid for the listed classification.
  - d. All deductions other than the allowable ones are explained.
  - e. Payroll computation (with the exception of the electronic machine computations) shall be spot checked to verify accuracy.
  - f. Payrolls once transmitted to the Project Manager cannot be returned to the contractor for correction of errors. Photocopies of the payrolls may be made and appropriate notes placed on the copies to explain the error(s) to the contractor. The contractor must submit revised certified payrolls or other forms of applicable evidence which provides documentation of the correction(s).
  - g. The Project Manager is to retain all payrolls until notified by the Controller Division that they may be destroyed. When the payrolls are complete, the Project Manager is to send a letter to the Construction Division Final Review Section in Lincoln, indicating the date the last payroll was received.
4. Most subsequent payrolls will require only a very cursory review. The Project Manager is encouraged to consider such things as the length of the project and the number of errors encountered on the first thorough examination when determining how many additional thorough payroll checks are performed.
5. On DR Form 84, "Record of Contractor Payrolls Received," the Project Manager should pay particular attention to the column head "Date Received" and to the "Payrolls Completed (Date)". A delay in submittal of payrolls will negate payment of interest on retained monies until receipt by the Project Manager.

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contemplated in the contract. As such, the minimum wage rates shall apply to all operations performed by the contractor or his/her subcontractor in processing, loading, and hauling the materials.

- e. The minimum wage rate requirements do not apply to bona fide owner-operators of trucks who are independent contractors. The certified payrolls including the names of such owner-operators need not show hours worked nor rates allegedly paid, but only the notation "owner-operator".
- f. The contractor is required to pay the minimum wage rates to drivers which he/she employs to operate trucks which he/she owns or leases from another party.

D. Apprentices

- 1. The contractor is not required to submit the Standard Form 1444 "Request for Authorization of Classification and Rate" for apprentices if verification is received that the employee is registered in a bona fide apprenticeship program.

@

E. Various outside agencies may request copies of payrolls under The Freedom of Information Act. The FHWA processes these requests. If you receive a request for copies of payrolls, have the person who is requesting a payroll contact the FHWA. The FHWA will request the payrolls from the Construction Division. The Construction Division will tell the PM to forward requested payrolls to the FHWA. The FHWA will remove any personal information such as name and Social Security Number before forwarding the information to the requesting agency.

103.27

**DISADVANTAGED BUSINESS ENTERPRISE (DBE) SUBCONTRACTOR**

A. Contract Award

On Federal-aid projects with predetermined goals, all bidders will be required to submit a required DBE Participation Form (see bid proposal package) with their bid. This form identifies DBE subcontractors, suppliers, transporters, and/or manufacturers that will be used to satisfy the DBE goal. The DBE Participation Form shall also include work or items to be subcontracted, cost of this work, percent applicable to DBE goal, and dollar amount committed to each DBE.

Upon execution of a contract, the prime contractor becomes committed to those DBEs goals listed on the form. This commitment is therefore a contractual arrangement between the State and the prime contractor with the same enforcement as any other provision specified in the contract documents. A prime contractor is required to enter into a contractual arrangement with each DBE listed by formally executing a written subcontract agreement specifying the work to be performed and appropriate compensation for that work. This two-tier process, which contractually obligates the prime contractor to both the State and each participating DBE, formalizes implementation of all DBE contract provisions.

The Contracts Office will review the low bidder's "Required DBE Participation Form" to assure that certified DBEs are being used. After review, the form will be sent to the Project Manager. The Contracts Office will also alert Project Managers if a DBE is going to perform work other than the type for which they are experienced. This will normally be by copying a letter from the Contracts Office to a prime contractor describing resources that must be provided by the DBE.

@ (Part of this paragraph is on Page 55)  
@ (Part of this paragraph is on Page 54)

The successful bidder must submit a letter to the Construction Division to get subcontractors approved.

B. Subcontract Approval

1. Temporary Employees and Leased Equipment

For all projects that require DBE participation, proposal notes will also require the prime contractor to attach a completed form to a subcontract request for each DBE subcontractor, supplier, transporter, and/or manufacturer prior to the preconstruction conference. The "Required DBE Participation Form" identifies the work that the DBE will perform, use of employees from other companies, and any work-related equipment that will be leased. Cost of equipment leased from the prime contractor shall not be counted toward the DBE goal. Do not attach a copy of lease agreements to the form.

The DBE must complete DR Form 203, "DBE Performance Record."

A DBE may lease equipment consistent with standard industry practice provided a rental agreement specifying terms of the lease arrangement is approved prior to a DBE starting work. If equipment is of a specialized nature, the lease may include an equipment operator. If this practice is generally acceptable within the industry, then the operator can remain on lessor's payroll. Such an arrangement shall be short term and involve a specialized piece of equipment used at the job site. For equipment that is not specialized, a DBE is expected to provide the operator and be responsible for all payroll and labor compliance requirements. Operation of equipment shall be subject to full control of the DBE.

2. Commercially Useful Function

The Project Manager must review information on the "Required DBE Participation" and the "DBE Performance Record" to determine if a commercially useful function exists. A commercially useful function exists when:

- a DBE is totally responsible for execution of a distinct element of work by actually performing, managing, and supervising the work involved in accordance with the contract documents, normal industry practice, and
- that DBE firm receives due compensation as agreed upon for the work performed.

To meet commercially useful function requirements of the regulations and contract, the following statements are applicable:

**103.31 CONTRACTOR'S SALES TAX EXEMPTION**

When a NDR contract is awarded, the Contracts Section of the Construction Division will issue the prime contractor a "Purchasing Agent Appointment" (DR Form 2-A) and an "Exempt Sale Certificate for Contracts" (DR Form 2-B). These forms allow the contractor to purchase materials that are to be incorporated into a highway project without paying any sales tax. The prime contractor is allowed to make copies of both forms and provide them to the project subcontractors for their use. The prime contractor must contact the Contracts Section [(402) 479-4851] to obtain an extension. The Contracts Section completes the extension by issuing a new "Purchasing Agent Appointment" (DR Form 2-A).

@

**103.32 LOTUS NOTES – NOTIFICATION**

Field personnel are strongly encouraged to open their electronic mail daily. The Construction Division (and others) use it regularly and expect messages sent to be messages read.

Any time a plan error/omission is discovered or if for any reason the contract must be changed, the PM should send a Lotus note with appropriate details to the designer (Bridge or Roadway), Construction Division, and if necessary, to Materials & Research.

**103.33 PRIME CONTRACTORS/SUBCONTRACTORS**

Project Managers should be reminded that correspondence pertaining to a subcontractor should be directed to the prime contractor.

## 104.00 -- CONSTRUCTION INSPECTION

### 104.01 CONTRACT TIME DETERMINATION (*SSHC Subsection 108.02*)

**Tentative Beginning Date** - The proposal will show a tentative date on which it is anticipated that the contractor may begin operations.

In most cases, the tentative beginning dates are established several weeks in advance of the letting date by determining the latest possible date the Department would like to see the work completed and backing out the estimated number of days required to complete the work. Consequently, any requests to delay the start of work on a project are examined very carefully before being approved. Additionally, the approval to delay the start of work on a project may be made contingent upon certain concessions by the contractor (such as the imposition of a disincentive payment for a late completion).

In the case of contracts involving multiple time allowances, extensive utility relocation, or work to be performed by others (e.g., railroads, cities, counties), it may be necessary to delay the start of work for several weeks after the tentative starting dates shown in the proposal.

If the tentative beginning date shown in the proposal appears to be earlier or later than believed possible or practical due to job, weather, traffic, or other conditions relevant to the project, the Construction Engineer should be notified promptly.

**Notice to Proceed** - The contractor will be given a Notice to Proceed by the Construction Division, and work should not begin until the notice has been issued (or at least verbally acknowledged) by the Construction Division.

Normally, the Notice to Proceed date will coincide with the tentative beginning date shown in the proposal; and the Notice to Proceed will automatically be issued after the contract is in place, **usually a week or two prior to the starting date**. In some cases, however, such as for seeding or landscaping projects, the Construction Division will check with the District Construction Engineer to verify that the site is ready for work to proceed before issuing the notice. The issuance of the Notice will also be delayed when a project is let far in advance of the tentative starting date -- almost always resulting in a request for an early start by the contractor.

@

**It should be noted that in SiteManager, the Notice to Proceed date is recorded in SiteManager under "Key Dates" as the "Notice to Begin Work" date. SiteManager's "Notice to Proceed" date is actually the contract execution date.**

@

Some contracts contain an "early start provision". For those projects, the contractor may begin work prior to the tentative starting date by notifying the District Engineer of his/her intent to begin work early. The notice must be given two weeks prior to the intended starting date and is not subject to review by the Department. When such notice is given, the District should notify the Construction Division of the need to issue the notice and the date for which it should be issued.

For those contracts which do not contain the "early start provision", requests to begin work prior to the tentative starting date should be made by the contractor directly to the Construction Engineer in Lincoln. In many cases, such requests are made following issuance of the original Notice to Proceed. If the request is approved, a revised notice will be issued.

Requests to begin work after the tentative starting date shown in the proposal should be made by the contractor to the Construction Engineer in Lincoln.

**Beginning the Counting of Working Days** - The counting of working days or calendar days must begin on the date established in the written Notice to Proceed or on the actual beginning date, whichever is earlier. **Accordingly, working day report entries should be made beginning with the established beginning date or actual beginning date – whichever occurs first. Entries should continue for each and every day (seven days per week) until the project has been tentatively accepted. Reports may be suspended when the work is suspended for an extended period.**

@

Under specified conditions, some items of work may be performed for which working days or calendar days will not be charged. **Even under these circumstances, however, working day reports must be created to document that work was performed without the charge of working days or calendar days.** Work subject to this rule is listed in *SSHC Subsection 108.02*.

@

**Calendar Day** - *SSHC Subsection 101.0313* gives the definition of a calendar day.

**Working Day** - *SSHC Subsection 101.0399* gives the definition of a working day.

**Current Controlling Operation** - *SSHC Subsection 101.0326* gives the definition of the current controlling operation.

While the counting of calendar days is quite straightforward and is usually dependent only on the passage of time, the counting of working days requires a determination of the current controlling operation. A basic test for the determining the current controlling operation on any given day is whether or not the non-performance of that operation will delay the completion of the work.

The contractor's project schedule can be a very useful tool in determining the current controlling operation. The specifications require that the critical path activities be shown on the schedule; and those activities, in essence, are the controlling activities. Because the specifications allow several types of schedules and because contractors possess varying degrees of skill in preparing the progress schedule, it is strongly recommended that the Project Manager and Project Superintendent discuss the project schedule and come to some mutual agreement concerning the path of critical activities - as may be the case when a bar graph shows several activities occurring at the same time.

The contractor has the right to object to the charge of working days, and those kinds of objections will be minimized if there is an "up front" agreement regarding the controlling operation. There usually will be little dispute regarding whether or not the work was performed.

The current controlling operation should be shown in the Project Manager's diary and on the working day reports. Any discussions or agreements with the contractor regarding it should also be documented in the diary. The assessment of working days is a very important task for the Project Manager, but should not be considered extremely difficult. Common sense and fairness should prevail.



Project Manager investigates and determines when shortages of materials are beyond the contractor's control.

Shortages of labor are specifically eliminated as justification for an extension of time (*SSHC Subsection 108.02, Paragraph 9*).

*SSHC Subsection 108.05* requires the contractor to employ sufficient equipment of adequate size and in such mechanical condition as to meet the requirements of the work. Accordingly, delays resulting from breakdown or malfunction of the contractor's equipment are not considered to be beyond the contractor's control.

**Working Day Report and Diary Record** - *SSHC Subsection 108.02, Paragraph 5* provides that the contractor will be furnished with a copy of the weekly report of working days. These reports are generated, compiled, and mailed from the Lincoln office at mid-week, so it is very important that the working day information is entered promptly following the completion of the week's work. **Special efforts should be made to impress upon consultants employed by the Department or other governmental agencies that they must submit their working day report information without delay at the beginning of each week.**

@

In addition to our contractual requirement to furnish a copy of the working day report to the contractor, these reports are reviewed by one or more individuals in the central office. The following information should be included on each report:

- Notice to Proceed date (Notice for Work to Begin)
- Actual starting date (Work Begin)
- Current Controlling Operation
- Hours Worked on the CCO
- Hours worked on non-CCO work if CCO hours are zero
- Reason for charge or non-charge of a day if the charge is not what might normally be expected. (Such comments must be entered into the "CCO" field in SiteManager to be visible on the report.)

It is the contractor's obligation to review the working day report when it is received and promptly file any objections to it. The Project Manager is obligated to promptly review the objections and rule on their validity. When such reviews are delayed until the project is complete, there is too great a risk that the details affecting the decision can be forgotten. Whatever the result, the decision should be documented -- either by letter (preferably) or diary entry when the objection is denied or by the issuance of a Time Extension Document when an adjustment to the time allowance is justified.

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(This page is continued from Page 69)

Although the contractor is required to file an objection to the working day count within 14 days, claims often fail to surface until the latter stages of a job when the remaining working days are few. For this reason, it is especially important that a complete and accurate diary record be maintained. For purposes of making the initial assessment of working days -- and any subsequent review -- the following information, if applicable, should be recorded or documented daily in the Project Manager's diary:

1. The current controlling operation
2. The weather
3. The work performed
4. Unusual or adverse weather or soil conditions encountered
5. Other unusual occurrences impacting work on the project
6. The times that major work operations halted and resumed and the reasons why
7. Changes in the work force effecting work on the controlling operation
8. Major deviations from the contractor's approved progress schedule
9. Conversations pertaining to any of the above

The need for this information isn't always apparent until the work is completed or until a request has been made for reconsideration of the charging of working days.

**104.05 WINTER WORK (Special Provision)**

@

Determination of contract working days charged during the winter is made according to the rules set forth in the Specifications unless the proposal contains what is commonly referred to as the Winter Work Provisions. This special provision will generally permit the contractor to work without the charge of days during the months of December, January, February, and March. (Days near December 1 and March 31 may be selected to delimit the period so that the affected period of time begins and ends on a Sunday or Saturday, respectively.)

The “winter work” provisions are usually included in contracts where the Department anticipates work to carry over from one construction season to the next. They may be added to a contract by preparing a supplemental agreement to that affect, but they should not be added automatically. For example, a contractor should not be rewarded with the winter work provisions when he or she has failed to complete a project as scheduled because of inadequate prosecution of the work.

On the other hand, a contractor desiring to start a project early or a contractor delayed for reasons beyond his or her control should probably be granted the winter work provisions as an encouragement to pursue the work.

The Project Manager may require the contractor to place temporary materials prior to a suspension in the following situations:

- A project (or a required intermediate portion) is not completed within the allowed contract time, **and**
- Work continues (or is required) after November 30th, **and**
- Due to weather conditions, work cannot be completed.

Typically, temporary materials will be required for safety or soil erosion considerations. All temporary materials shall be furnished, placed, and removed (if required) prior to start-up at the contractor's expense.

**Project Suspensions**

If work is suspended, with approval of the District Engineer, working days would not be charged.

**104.06 WEEKLY REPORT OF WORKING DAYS**

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Working day reports are maintained in and generated by SiteManager.



A contractor may request a price adjustment to recover lost administration expense for underruns amounting to more than 25 percent of the bid amount for a major item of work. A contractor is allowed to recover only that portion of lost administration expense represented by the underrun.

By the same reasoning, a like price adjustment may be made to reduce the cost of major items of work which overrun by more than 25 percent, since the contractor should have already included overhead expenses in their bid. Overrun price adjustments apply to only that portion/quantity which is more than 125 percent.

**Agreed Unit Price.** Extra work orders based on an agreed price or lump sum should have overhead considered as a part of the negotiation. The agreed unit price may include the cost of overhead for handling subcontracted items. It may be included in lump sum items if justified. However, if negotiations specifically excluded markup, the item may be shown as a separate entry on a cost work up sheet.

**Force Account.** (*SSHC Subsection 109.05*) Specified force account percentages for labor and material are intended to cover all costs that a contractor may incur due to the work, regardless of who does that work (prime or subcontractor). Force account work to a subcontractor will be authorized for additional administration percentage to a prime.

### **Plan Revisions**

Often, plan revisions result in Change Orders having to be negotiated. Processing Change Orders resulting from plan revisions is sometimes delayed due to disagreement on prices, lack of success in obtaining qualified subcontractor(s), or various other reasons.

It is imperative that Project Managers actively pursue Change Order negotiations to an early conclusion, especially if proposed work involves public safety (guardrail, safety enhancement, etc.) or work related to a prolonged detour. Obviously, agreement on unit prices is desirable. However, there are times that work will have to proceed on a Force Account basis. In all cases, documented agreements on the Method of Measurement and Basis of Payment for extra work items must be obtained before the Change Order is written. NOTE: No work can begin until the contractor has either agreed to a Change Order or agreed to a basis of computing force account costs.

### **Change Order Approval Limits**

Contracts are awarded for a specific dollar amount. Overruns or change orders expend additional funds and can only be authorized by specific people.

### **FHWA/Certification Acceptance**

@

FHWA projects that have full oversight have "FHWA" stamped in red on the front page of the proposal. The Contracts Section makes the determination and affixes the red stamp.

@ On FHWA oversight projects, current rules require that expenditures in excess of \$10,000 be discussed with the FHWA. The Construction Division is attempting to raise that dollar amount to \$50,000.

The following table shows the Department's approval limits:

APPROVAL LIMITS	
Deputy Director	Over \$150,000.00
Construction Engineer	\$50,000.00 to \$150,000.00
District Engineer & DCE	\$0 to \$50,000.00

@

### Preparation of Change Order

The following instructions are applicable in the preparation of a Change Order-Supplemental Agreement:

- Create a brief description of the work not in the contract.
- Show reasons for the change; or, if the document is a combination change order-supplemental agreement, show purpose of the agreement. When the work to be performed is not covered in the specifications, the name of the items shall be worded to define the work to be performed. References should be made to similar items in the specifications or plans and the method of measurement and basis of payment definitely established.
- Show the basis of the unit prices established, such as comparison with unit prices for similar contract items or the previous year's average contract unit prices.
- Include statement as to the determination of a change in the contract time allowance.
- Show the name of the FHWA engineer and date of discussion with him/her when the Change Order is for more than \$10,000.00 and the federal-aid contract is for more than \$1,000,000 and on the Interstate.
- Enter estimated increased and decreased changes in quantities of items of work. Use standard item numbers and standard specification/contract wording, when applicable, for the new item description you define.

All Change Orders (CO) and Change Order-Supplemental Agreements (CO/SA) shall address the subject of additional working days or calendar days, if any, to be added to the contract time allowance.

The original working day or calendar day allowance is calculated by assigning some average rates of progress to the various items of work and then making some assumptions as to which items might tend to overlap during the actual performance of

### **Cost Overrun/Underrun Notification (DR Form 74)**

When project costs overrun or underrun by \$50,000 or more and the change in cost is not reflected in a "Change Order/Supplemental Agreement", the Project Manager shall prepare and send a "Cost Overrun/Underrun Notification" (DR Form 74) to Laurie Burling (BURLING) as an attachment via Lotus Notes. Laurie will print the form and circulate it for the appropriate approval signatures.

@ DR Form 74 is available on Server 50 in the folder titled DORFORMS. Space is provided in the identification block in the lower-left corner to provide a unique identification before saving the file. The Project Manager's name must be shown in the "Prepared by" window, but an actual signature is not required to submit to the DR Form 74 to the Controller Division.

Please note that the net change in the total project cost --- not an individual group --- shall be the determining factor when deciding if an event should trigger the preparation of DR Form 74. Caution is necessary as it is not always apparent when the costs have overrun by more than \$50,000. However, as soon as an overrun/underrun of \$50,000 is noticed, then a DR Form 74 must be initiated by the Project Manager.

### **Work Orders**

(SSHC Subsection 109.05) - If there is sufficient time to execute a change order-supplemental agreement or force account agreement prior to beginning the extra work, no work order need be issued. The change order-supplemental agreement or force account agreement shall provide the basis for authorization and payment for extra work. The change order-supplemental agreement and force account agreement shall be prepared in accordance with the instructions in this manual. The work order shall state that the work will be done either by change order-supplemental agreement or by force account agreement.

If prices can be agreed upon at the time of writing the work order (see SSHC Subsection 109.05, Paragraphs 8 and 9 regarding rental rates), but insufficient time exists to permit execution of a change order-supplemental agreement, a work order shall be prepared authorizing such work and then be followed by a change order-supplemental agreement formalizing the prices or basis of payment stated in the work order.

If negotiated prices cannot be agreed upon at the time of writing the work order, the work will be done by force account. Under certain circumstances, when approved by the Construction Engineer, this may be changed at a later date to a change order-supplemental agreement.

The work order shall be signed by both the Project Manager and the contractor or his/her superintendent.

The Project Manager and District Office shall implement the following procedures to expedite payment for extra work.

**104.20 FIELD TESTS**

**104.21 FIELD TESTING ON CONSTRUCTION PROJECTS**

**Materials**

All sampling, measuring, and testing for construction project quality control shall be performed as prescribed in the NDR Materials Sampling Guide and the NDR Standard Method of Tests.

**Project Acceptance Sampling and Testing**

Both construction inspection personnel and the contractor are responsible for the field sampling and testing portion of project acceptance tests. The Project Manager must review inspector assignments and maintain a program of continuing training for personnel and training of additional employees if required. Samples taken by inspectors and submitted to District or Central materials laboratories must be properly and completely identified on "Sample Identification Form" (DR Form 12) or other appropriate forms as required.

The *Materials Sampling Guide* shows the minimum required frequency of tests for various types of work. Additional tests should be made as necessary for adequate project control. Reports showing test results must include all tests made.

***Reports do not need to be included in field books or diaries.***

**Assurance Sampling and Testing**

@ *SSHC Section 1028* discusses the requirements related to asphalt assurance sampling and testing, most of which are Materials and **Research** Office responsibilities. Occasionally, assurance samples have not been taken on some projects because timely notification of ongoing work was not made. This has been more common with test cylinders from bridge deck pours and culvert projects.

@ While the actual taking of assurance samples remains the responsibility of Materials and **Research** personnel, it is of equal importance that project inspectors provide timely notification regarding available dates for testing.



The final 1.8 m (6 feet) at the end of a bridge and at an expansion joint are not included in testing or evaluation, but should be included in computations for incentive or price adjustment assessments. These areas will be evaluated for deviations exceeding 3 mm (1/8") in 3 m (10 feet).

Profilograph tests for bridge approach sections or overlay of bridge approach sections are run 1.0 m (3 feet) from the outside lane line of each traffic lane. These areas shall be corrected for smoothness and will not be used in the computation for incentive or price reduction of bridge decks or bridge deck overlays.

#### **104.53 BUMP CORRECTION**

Exact location of 10 mm (3/8") bumps requiring correction has proven difficult particularly on resurfacing projects. Referencing by station location, string line, and rolling straightedge often lacks the precision necessary for identification of exact bump locations. Locate bumps on the pavement surface during initial profilograph testing with spray paint or have a profilograph available during correction to locate bumps and monitor correction results.

#### **104.60 LIQUIDATED DAMAGES & EXTENSION OF CONTRACT TIME**

##### **Liquidated Damages** (*SSHC Subsection 108.08*)

The Construction Division will assess liquidated damages based on the District's recommendation.

The Construction Division will be responsible for settling liquidated damage disputes.

If project level good faith efforts fail to resolve differences, the Project Manager shall request negotiation assistance from the District Construction Engineer. In addition, factual information relative to the issue(s) shall be forwarded to the Construction Engineer.

Should combined efforts described above fail to resolve dispute(s), the issue will be considered to have reached an impasse. At this point, a meeting with all affected parties shall be scheduled with representatives from the Construction Division.

##### **Contract Time Extensions** (*SSHC Subsection 108.02*)

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In SiteManager, all time extensions are change orders and the "Contract Time Allowance Extension Document" (DR Form 16) is obsolete. The value of a time extension is the liquidated damage amount times the number of days extended. The "Approved Limits" chart in Subsection 104.08 applies to time extension change orders.

A good example would be when a contractor was held up due to a delay in delivery of material and it was necessary to charge working days until the contractor provided proper documentation. After proper documentation, the contract time allowance is extended by the District for the amount of working days assessed during the delay.

It is intended to use this means to correct mischarged days rather than going back and revising the working day report. An example of this would be when a contractor

contests the working day charges shown on the working day report and he/she is considered to be correct.

The "Head to Head", "Detour" and "Earth Shouldering" time allowances are specific time allowances within the time frame of the overall contract allowance. They usually are not, but can be, affected by contract time extensions.

@

*(Deleted paragraph)*

SSHC Subsection 108.02, Paragraph 6 says the Project Manager will grant an extension in the working day time allowance consistent with delays resulting from conditions beyond the contractor's control.

The Project Manager should be careful to keep complete and accurate records and information on any conditions or circumstances which delay the work. The Project Manager should keep good records, particularly on circumstances in connection with acts by the State and delays (to the work) caused by other contractors. If such delays are involved and the time allowance is exceeded, the contractor will surely request and be entitled to an extension in the time allowance. In the fair handling of such requests, the Construction Division review relies principally on the records kept by the Project Manager, and accurate, complete records on any such delays are of prime importance.

If the working day time allowance has been exceeded, the Project Manager should prepare a resume of the working days charged to accompany the final records. The resume should be based on a review of the working days charged, considering any requests for extensions in time made by the contractor.

When the value of the work completed during the first half of the contractor's pay month exceeds the amount stipulated in the specifications (usually \$10,000.00), a semi-monthly contractor's estimate is prepared. All partial payments are made on satisfactory work and materials only, as evidenced by complete certifications or test results as required. Defective work or material shall not be included for payment until the defect has been remedied.

## 105.05 FIELD MEASUREMENT AND PAYMENT

**Photographs and Video Tapes** - Documentation on film can save many questions and provide critical answers. Take a picture any time it may be helpful.

**Field Records - General** - Payment for most contract items is based on the plan quantities. Final measurements should be avoided as long as the specifications permit and the contractor does not dispute the quantities. Their construction should, however, be documented as described under "Inspection Notebooks" with the statement (if applicable) "Constructed as per plans" and substantiating data or measurements, if necessary, also entered in the record.

Field records must be properly kept to substantiate that the contractor has conformed to the requirements of the plans, specifications, and Special Provisions both as to quantity, usually involving measurements, and quality, usually involving tests, of the work or material items used on the project.

Instructions and examples of preparation of specific records may be found in this manual in *Appendix 3*.

@ **Field Notebooks** - Field measurements made for pay items of work and records of placement of materials shall be entered directly in **SiteManager** or in bound field notebooks **when the project is not in SiteManager**.

@ Field tests on quality of materials may be made as original entries on printed forms in accordance with instructions from the Materials and **Research** Division.

@ The ORIGINAL copy of the form shall be submitted to the Materials and **Research** Division. Inasmuch as this original will take the place of the permanent record in the field notebook, the same restrictions on corrections will apply to the new form as have been in effect for field notebooks. **A single line should be drawn through any error and the correction entered. (No erasures allowed.)**

@ It will be necessary for the Materials and **Research** Division to **make** copies of the original to use as work sheets. In order to have readable copies, please use a black ball point pen or a soft pencil (H) when making the original copy.

The notebook records should indicate the stationing used, date placed or constructed, and sketches with dimensions if necessary to give clear understanding of the placement and material used. The names of the party or engineer making the measurements and dates performed must be entered in the field notebooks. A minimum requirement of most "Pay Measurement Notebooks" (for example, those for final cross sections, slope protection, seeding, etc.) would be such an entry on the first page and date and recorder initials on succeeding pages of each day's work. Materials used in the

*SSHC Subsection 1001.02* requires:

Materials which must be documented by a certificate of compliance, certified test, or test reports shall not be incorporated into the work until such certificates have been delivered to the Department and verified for compliance.

@ It follows from the above that material items which have not been tested and accepted, or for which appropriate certification, as defined in the Materials and **Research** Manual, has not been delivered to the State, should not be included on an estimate for payment. Likewise, no material item which has been stored in accordance with Paragraph 4. of Subsection 109.07 of the Specifications should be included on an estimate for payment unless the appropriate test data or certifications for compliance with the specified requirements are in the files of the Project Manager.

The Project Manager shall maintain documentation of progress estimate quantities.

@ **Types of Contractor Estimates** – **SiteManager** has only three types of estimates:

- **Progress** – all estimates prior to the “Final Estimate.”
- **Final** – generated once District has completed its review and is ready to forward the project to Lincoln for “Finaling.”
- **Supplemental** – all estimates generated to change the “Final Estimate.” Additional estimates are obsolete in SiteManager. However, the PM must notify the Construction Division when a project is complete – which used to be the purpose of the additional estimate. In SiteManager, the PM must send a Lotus note to “DOR-CONST-COMPLETION NOTIFICATION.” The Finaling Manual explains what must be included in the “note.”

**Processing Estimates** – Each District should direct a copy of signed estimates to the Construcion Division printer (CON1) as soon as possible after affixing the electronic signature.

Each District is encouraged to sign and print estimates as often as possible. The uniform and steady arrival of estimates in Lincoln is encouraged and appreciated by both the Construction Office and the Controller Division.

**Contractor's Statement of Compliance (Form WH-348)** - Form WH-348 shall be submitted for each weekly payroll period by each contractor and subcontractor on all projects financed by Federal Funds. (Form WH-348 is not required on other than Federal-Aid projects.) The WH-348 form should be attached to and submitted to the

Project Manager with the contractor's payrolls and kept in the District. The Project Manager should maintain a record of WH-348s and payrolls received. The WH-348 for the last week of work shall clearly indicate that it is the final report.

The contractor and subcontractor are required to submit the payrolls with Form WH-348 weekly. Payrolls shall be considered delinquent when they are not in the Project Manager's hands by the seventh day after the date on which the employees are paid. The Project Manager shall defer the release of progress estimates until contractors comply with this rule. The Project Manager shall notify the contractor by letter of any delinquent payrolls or Forms WH-348 in advance of the estimate date.

**Contractor's Statement of Materials and Labor - (Form FHWA-47).** Form FHWA-47, "Statement of Materials and Labor", shall be submitted by the contractor as required and explained in Section VI, Record of Materials, Supplies and Labor, Form FHWA-1273 (Rev. 4-93). The FHWA-1273 is included in every Federal Aid project. The contractor shall submit one copy of this report to the Lincoln Construction Division. If this report has not been received when the final records are sent to the Lincoln Office, the Construction Division shall withhold release of the final estimate until the Form FHWA-47 is received.

#### 105.07      **FIELD COMPUTATIONS FOR FINAL PAYMENT**

**General** - The quantity of each item of work on the project shall be computed and checked by the Project Manager and his/her assistants. Computations must be complete so that each step may be easily followed without completely checking the mathematics. The date and initials of persons performing computations and verifications should be shown on each sheet of the field notes, cross sections, and computations. Unless this information is shown, it will be necessary for the work to be duplicated in the District Office.

All computations will then be reviewed in the District Office to determine the correctness of the method used in computing the quantities of the various items. Sufficient checks of the mathematics should be made to determine the care and accuracy used in preparing the computations. A check should be made to determine if all necessary, supplemental and force account agreements have been executed. Considerable discretion must be exercised during the District review in order to ascertain the accuracy of final computations and yet eliminate needless rechecking.

The Construction Division will not check all projects. Only random audits will be performed.

**Roadway Excavation** - Final earthwork quantities may be computed by either of two methods or a combination of the two methods.

- A.      **Data Collector** - When the preliminary survey was entered in a Data Collector, then all survey data during and after construction can be modeled with **GeoPak**. Final cross sections are computed by **GeoPak** once the final surface shots are input in the Data Collector. Cross sections can be taken at any location by **GeoPak**.

specifications in order to avoid payment for extra water in the material. Frequent moisture tests should be made at the time of measurement.

*SSHC Subsection 307.04* says moisture content at time of measurement shall be between optimum and 3 percent below optimum.

**Gravel Surfacing** - Gravel surfacing computations should be submitted on DR Form 264.

Since the payment the contractor receives for gravel depends on test results and computations shown on this form, it is extremely important that both the testing and the arithmetic be accurate. Placing information shall be shown in the field books.

"Truck Capacity Computations", Form DR-101, are necessary when trucks are hauling such items as gravel, sand, filler, etc. and payment is to be on a cubic meter (cubic yard) basis. This form shall be prepared promptly at the beginning of the work and submitted to the District Office. The type of material being hauled shall be noted on the form.

If trucks are transferred to another project under the inspection of the same Project Manager or inspector during the construction season, it is not necessary to remeasure the trucks or submit DR Form 101. However, always inform the District Office of the transfer.

This information should include the name of the owner and license number, capacity of the truck, original project number on which the truck was measured, and the new project number.

**Prime Coat and Tack Coat** - (See *SSHC Sections 504 and 517*) - Asphaltic materials for prime coat and tack coat shall be measured in liters, corrected to 15°C (60°F). If the material is delivered in tank cars, the quantity is usually determined by measuring the mass or metering at the source. If this is not done at the source, the mass of the material must be measured at the point of delivery.

When material is transported directly to the work in trucks, the mass shall be measured on scales.

If the material has been metered, the volume at 15°C (60°F) shall be determined. (Contact Materials & Tests Division for proper conversion factors.) Any material that is lost, wasted, used on private work, or transferred to other projects shall be deducted. Tank cars and trucks shall be checked to verify that they have been entirely emptied before returning to the refinery.

When asphaltic material is transferred from the project, the Project Manager shall measure the material before it leaves the project and immediately notify the Materials and **Research** Division that the material is being transferred. The Construction Division and the District Engineer(s) should also be notified. The notice shall be by the DR Form 193, Transfer of Asphaltic Material. If possible, it is advantageous for a copy of this report to accompany the transferred asphaltic material.

@

**Asphaltic Concrete Surface Course and Base Course** - Tickets may be furnished by the Department or by the contractor. The contractor may furnish the tickets if he/she wishes to use automatic printing equipment. If the contractor desires a copy of the scale tickets, they should be prepared in triplicate. The original should be received by the laydown inspector. The first copy is the contractor's copy, and the second copy is for the project records.

The liters of asphaltic cement shall be measured as shown in *SSHC Subsection 503.05*. (HINT: A common final computation error is the failure to deduct asphalt cement used in wasted asphaltic concrete from the final pay quantity.)

**Concrete Pavement** - The number of square meters (square yards) of concrete pavement to be paid for will be the plan quantity. Widths and lengths of irregular areas built other than as shown in the plans shall be measured and recorded in a data collector and the areas computed, or computations made from staking data providing no changes occurred during the actual construction. Quite often the plans indicate the quantity (square meters) (square yards) involved in intersections, driveways, and the more complex sections of the projects. In these instances, the quantity indicated on the plans for a given area may be used as the final pay quantity, provided that no geometric changes have been made from those shown on the plans and that a rough check of the quantity shown has been made to determine if any apparent errors exist.

In determining the final quantities for concrete pavement or base course on an area basis, deductions will be made for fixtures in the roadway having an area greater than 1.0 m<sup>2</sup> in accordance with *SSHC Subsection 109.01, Paragraph 1.b*.

@ When municipal paving projects involve several items of work for which payment is made on an area or length basis, such as sidewalk, curb, curb and gutter, driveways, pavement, etc., it is suggested that complete sketches be prepared in **Microstation** or on cross section paper to show the actual work performed as well as the computations for the pay quantities. As a general rule, two complete sets of sketches should be prepared. One set should show the removal items and the other set should show the new work. The measurements and dimensions included with these sketches should be clearly identified as to whether they are actual field measurements or computed dimensions.  
@ The computations should always be shown on, or accompany, such sketches.

When municipal paving projects contain various radii curves at street intersections, concrete paving area measurements and computations may be based on the chord and rise method. Dimensions used for final payment will be as staked dimensions. (This assumes any difference is a contractor error.) The only exception would be if the area was constructed smaller than it was staked.

Combination curb and gutter is measured for payment by the meter (linear foot).  
(*SSHC Section 606*)

### **Removal of Existing Structures and Preparation of Existing Structures** (*SSHC Section 203*)

- A. **Removal of Existing Structures** - Unless the contract contains a unit bid for the removal of an old structure, the excavation necessary for such removal is paid

prepare and forward a letter to the contractor, substantially in accordance with the example included in *Appendix 3*.

The receipt of such letters from the Project Manager and contractor, plus the required releases from the pit owners, will complete the records required by the Right of Way Division to enable them to make payment to the owners of local pits. In the case of borrow, taken on an acreage basis, sketches are to be prepared showing the dimensions of the individual pits, the name of the owner, the description of the land subdivision, ties with the project centerline and computations for the acreage included in the letter to the contractor. Such sketches shall be forwarded to the Right of Way Division together with their copy of the letter to the contractor.

When the option block in the plans for the local pit includes payment for incidental items such as temporary fencing, reseeding, crop damage, payment for haul road, etc., the consideration for such incidental items will normally be on a lump sum basis and the lump sum payment for such items shall be included in the letter to the contractor. If payment is stipulated in the option block, for such incidental items, on other than a lump sum basis, the Project Manager shall request the Right of Way Division to advise the proper method of handling the item.

When work is to be suspended for the winter season, or for any other reason, for a considerable length of time and it is desirable to make partial payment to the landowners, the necessary information to authorize partial payment shall be forwarded to the Right of Way Division and, in such cases, it is not necessary to advise the contractor. In the event that a section of the project, involving optional borrow pits, is completed or the work is completed on some of the local pits, the normal letter to the contractor should be prepared in which it shall be noted that information will be forwarded at a later date for the remaining borrow or material pits.

In order to complete the records and eliminate any questions, the Project Manager's letter to the contractor must cover all optional borrow and local pits shown in the plans, regardless of whether they are actually used.

There have been some cases where a pit under state option does not appear on the plans for a particular project but does on an adjacent project. The contractor, if he/she uses this pit, must still be responsible for royalty payments.

Royalty payments for local pit material will normally be made on a cubic meter (cubic yard) basis and such quantities may be determined by preconstruction and final cross sections. In cases where payment to the contractor is based on truck measurement the royalty payment may be based on the same measurement, or by using weight conversion factors where payment to the contractor is based on units of mass.

**Borrow and Local Pit Materials Furnished by the State or County and Not Involving the Contractor** - When borrow or local pit materials are purchased from the owner directly by the Department or County, and no option requirements involving the contractor are included in the plans, substantially the same information must be forwarded to the Right of Way Division. However, no letter need be written to the contractor. **The PM must obtain a site release from the landowner on these Department obtained borrow sites.**

@



### **Notification of Project Completion (DR Form 91) - All Projects**

The Project Manager will prepare an acceptance letter and forward it to the DCE to notify the contractor of tentative acceptance.

@

The DR Form 91 (Notification of Project Completion) should not be prepared and distributed until the work is really done --- such as when a 180-day observation period is required on paint. Wait until the 180 days have past, then determine if all work is acceptable, and then complete the form.

The Controller Division uses the form to trigger final payments, so they want work which the county or city promised to do included in the definition of "complete." They explain that although the local government may have performed the work, the value of that work is included in their bookwork and subsequent notification to the FHWA.

Immediately after completion and acceptance of a contract, the DCE/DE will prepare and sign a DR Form 91.

The DR Form 91 shall be completed promptly and forwarded to the District Engineer. In essence, this means construction work is complete and the contractor does not need to come back. However, processing DR Form 91 should **NOT** be held up waiting for finalization of paperwork, including material certifications and/or "Change Orders."

- Preparing a "Notification of Project Completion" (DR Form 91) is self-explanatory. All applicable blanks are to be completed.
- The DCE/DE, after signing DR Form 91, shall forward it to the FHWA, as applicable. Distribution within NDR is shown on the form.

#### **106.05 FINAL PACKAGE**

Refer to the *Final Review Process Manual* to finalize a project and determine documents to forward to the Construction Division.

#### **106.06 FINAL COMPUTATIONS**

When submitting final computations for any project, there shall be a statement by the District Engineer to the effect that any and all trucks which hauled materials, incorporated into the work on a volume basis, have been measured, computed and checked for volume specified.

#### **106.07 ACCEPTANCE AND FINAL PAYMENT**

**Final Inspection and Acceptance** - The District Engineer shall make the final inspection of the project. Generally, the contractor will be required to complete all items of work included in the contract before the final inspection and total acceptance of all contract work is made. However, it is the Department's policy to make a tentative acceptance of completed groups of a contract which have a separate time allowance. This tentative acceptance relieves the contractor of maintenance responsibilities for such groups. It does not relieve the contractor of the liability for any damage to the completed work caused by his/her operations in completing the remaining groups of work, or the liability for any defective work discovered in any item of groups of work prior to final acceptance and payment.

Before advising the District Engineer that final inspection of the project is desired, the Project Manager shall make a careful inspection of the work with the contractor's superintendent. He/she shall direct the superintendent's attention to any additional work which he/she considers necessary before the final inspection is made. He/she shall also

make certain that the contractor has complied with *SSHC Subsection 105.12* regarding the contractor's use of land obtained by the Department.

After the work has been completed, the District Engineer shall within one week advise the contractor in writing that the work is tentatively accepted by the Department. **The Project Manager shall include in the acceptance letter a list of documents that are missing.**

In the event the Federal Government is participating in the work, the District Engineer shall notify the Division Administrator of the Federal Highway Administration immediately upon completion of the total contract or direct labor project agreement items on any project. This report shall give the actual date that all contract work was completed. If any direct labor work, such as a reflectorized railroad crossing signs, etc., which are a part of the detail estimate, are constructed later, the date of their completion becomes the completion date for the project.

@ **The PM must notify the Construction Division when a project is complete. In SiteManager, the PM must send a Lotus note to "DOR-CONST-COMPLETION NOTIFICATION." The Finaling Manual explains what must be included in the "note."**

**Interest Payments on Delayed Estimates** - State law provides that, "if the contractor has furnished the Department all required records and reports, the Department shall pay the contractor interest on the amount retained and on final payment due the contractor beginning the sixty first day after the work under the contract has been completed, as evidenced by the completion date established in the department's letter of tentative acceptance, and running until the date when payment is tendered to the contractor.

The contractor is allowed fourteen calendar days from the date of notice as evidenced by the date of the letter of notification to:

- (1) Reply to the project manager's written notification of optioned pit material quantities and costs involved in a project (such reply shall be directed to the Department's Right-of-Way Division).
- (2) Provide signed records or documents, such as Change Order – Supplemental Agreements, requested in writing by the Department.
- (3) Provide all required records and reports, such as payrolls, material certifications, etc., requested in writing by the Department.

In the event the time interval stated above is exceeded, deductions to the interest time period will be made for the actual number of days to complete the action which occur beyond the original sixty calendar days.

It is essential that the acceptance letter include the correct completion date which shall be in agreement with the completion date as shown in the Project Manager's weekly working day and progress reports. This date will be the last day on which any work is performed on the project, and may be several days after the last working day charged. This condition will occur when minor finishing or cleanup work is required prior to tentative acceptance.

In order to eliminate or minimize interest payments and provide adequate time for processing through the various NDR Headquarters, it is essential that the final records be completed and reviewed in the District Office as soon as possible after the actual completion date. This will require that the final measurements and computations be completed to the greatest extent possible during the time that construction is in progress and will require the taking of final cross sections for grading work (only when plan quantities are disputed) as early as possible. In some Districts, the volume of grading work will undoubtedly require the organization of "floating" parties to take final cross sections, which will require adequate District planning in advance of the need for such parties.

@

**Section.** The costs of each group of work performed in each subdivision shall also be shown on the summary and distribution sheet, DR Form 44, Summary and Distribution of Cost, prepared for the project. If DR Form 44 has insufficient columns to accommodate all the Municipal and Rural Sections required by the Federal Highway Administration, it shall be extended to the right by securely attaching sufficient columns from another DR Form 44.

9. Accounting records require that construction costs be prorated to individual counties. Therefore, county splits must be shown on DR Form 44.
10. Many times, the District Office files do not contain copies of the Certified Analysis of Asphalt Material received on the projects and it is requested the Project Managers include their copies with final computation when transmitted to the District Review Section. When they have served their purpose they will be returned.

**Alternate Crop Damage Procedure**

The Right-of-Way Division is leaving the way to present the crop damage payment up to the Project Manager. If the acreage is between 1/4-acre increments, go to the higher increment. 1/4 acre will be the minimum.

If the farmers accept the affidavit price, payment will be made within a few weeks. If they do not accept the affidavit price, payment will not be made until the crop is harvested and sold.

If the Project Manager runs into a crop that is not covered or the amount is not agreeable, make the measurements of the field and forward them to the Right-of-Way Division. They will in turn send them an affidavit asking for the average yield for the rest of the field, and the price they were paid when the crop was sold, minus harvesting and marketing costs.

The sources of information used in determining the average yield, average price, and the average cost were obtained from the Cooperative Extension, Institute of Agricultural and Natural Resources, and the Farm Custom Rates, University of Nebraska.

CROP	1/4 Acre	1/2 Acre	3/4 Acre	1 Acre
Irrigated corn	\$75.00	\$150.00	\$225.00	\$300.00
Dry corn	\$40.00	\$ 80.00	\$120.00	\$160.00
Irrigated soybeans	\$62.00	\$124.00	\$186.00	\$248.00
Dry soybeans	\$48.00	\$ 96.00	\$144.00	\$192.00
Wheat	\$31.00	\$ 62.00	\$ 93.00	\$124.00
Oats	\$21.00	\$ 42.00	\$ 63.00	\$ 84.00
Milo	\$32.00	\$ 64.00	\$ 96.00	\$128.00

Alfalfa was not included because the variables of age and cuttings affect the averages greatly. Other crops (beets, edible beans, potatoes, etc.) were not included because of insufficient information.

### **Clearance Letter**

The Project Manager shall submit a letter to the Construction Division (with copies to Motor Carrier Permits & Facilities Maintenance) indicating clearance on bridges, sign trusses, and other structures that create a clearance limit.

### **106.11 OVERRUNS AND UNDERRUNS LETTER**

@ The summary of overruns and underruns letter, which used to be submitted when a contract is finalled, is no longer required. However, a DR Form 74, Cost Overrun/Underrun Notification is required whenever contract quantities overrun/underrun by \$50,000.00 or more. This letter must go to the Construction Division and the Controller Division so that appropriate redistribution of funds is made as soon as possible. This letter is sent as soon as the change in contract quantities is known. The Controller Division will obtain appropriate approvals.

### **106.12 CONTRACTOR EVALUATIONS**

The Contractor Evaluation is to be completed on every contract and subcontract except "trucking" subcontracts. SiteManager and CICS-1 identify if a subcontract is for "trucking". (Trucking subcontractors may receive an optional evaluation at the PM's discretion.) An evaluation is also to be completed on all bridge painting projects regardless of the size of the contract. Project Managers shall prepare and sign one copy of the form, include any remarks deemed pertinent, and forward one copy to the contractor and the original to the District. The District Engineer may add comments, sign, and forward to the Construction Division. The evaluation should be completed within 30 calendar days of the field completion date shown on the DR Form 344.

For evaluations of subcontractors, report type of work done by that subcontractor.

@ **Contractor evaluations are required for subcontractors at any level, including 2<sup>nd</sup> tier subcontractors.**

The intent of an evaluation is to report strength and/or weakness of a contractor's project related activities including paperwork, material documentation, attitude, and cooperation. Special attention should be given to contractor ratings of "poor" and "unsatisfactory." Remarks should be included for any individual item(s) that is rated less than fair. Also good remarks should be included when a contractor is given a high rating or deserving recognition.

The Construction Division maintains a file of the completed form, reacts to low evaluations, and seeks to improve contractor project administration. Evaluations are also used as a factor to establish bidder qualifications. Therefore, it is very important that contractors are evaluated realistically, factually, and without bias. The rating system developed is intended to produce a rating of "good" when the minimum acceptable performance requirements are met.

A series of less than satisfactory evaluations may be grounds for disqualifying bidders from further contracts or reducing their bidding qualifications.

It is anticipated that lower than average ratings would have been discussed at a meeting between the Project Manager and contractor representatives prior to form submittal. A contractor should have an opportunity to discuss and understand why a low rating was given. Further, a contractor should be given (if requested) a critique of corrective actions which would prevent reoccurrence of low rating(s).

The RDP Form 344, Evaluation of Contractor, is available on the computer or you can use paper copies.

To provide a broader evaluation of the contractor's performance of his/her work with reference to his/her equipment, personnel and prosecution of work, RDP Form 344 "Evaluation of Contractor" has been devised. This report is to be completed by the Project Manager for the prime contractor and subcontractor(s) for each separate time allowance under a contract and submitted with the final computations.

The contract value for the prime contractor shall be the original contract value (not final value). The subcontract value used shall be that authorized by the subcontract approval letter. All subcontract approval letters will show the value of the work being subcontracted.

The working days allowed shall reflect all time extensions approved either by letter from the Construction Division during the progress of the work or by supplemental agreements. If a time extension is forthcoming due to "extra work" a correction in the field entry will be made by the Construction Division. However, extra work should be a consideration taken into account in evaluating the prosecution of the work. When this is the case, an explanation to this effect should be made on the reverse side of the form.

@ *(Deleted paragraph)*

**106.15 UNAUTHORIZED WORK**

The contractor should not be permitted to perform work without line and grades established by the Project Manager.

The contractor should not be permitted to perform any work prior to the execution of the contract by the Construction Engineer. The Project Manager can request to be advised by telephone when the contract has been executed, if the contractor is "standing by" awaiting such execution to begin work.

**106.16 USE OF ADJACENT LAND UNDER CONTRACT OR LEASE**

We no longer require the contractor to provide a release letter. The contractor is responsible to the landowner and the Department will stay out of the agreement unless the Department acquires the access rights.

Option pits obtained by the Department will require a site release. The Project Manager shall contact the landowner and obtain the site release. The release should be obtained as soon as possible while the contractor is still on site with equipment to make corrections.

**106.17 FINAL CLEANING UP**

The importance of timely cleanup of cast-in-place concrete structures should be discussed at the pre-construction conference. It is the Department's policy to request the contractors to perform the necessary cleanup in flood plains at the earliest possible time to prevent scrap lumber, nails, form ties, etc., from being flushed out on adjacent landowners.

If this material is deposited on adjacent landowners, the contractor must satisfactorily gather and dispose of it before final acceptance of the work involved. It is in the contractor's and the Department's best interests to keep this cleanup work "current".

The District Engineer should be advised if the contractor refuses to perform this work in accordance with this policy and a field book entry made each time the contractor was contacted. Progress payments can be withheld until the area is cleaned.

The contractor shall make a final cleanup of the highway, borrow pits and all ground (off or on the project) occupied by him/her in connection with the work, leaving it in a neat and presentable condition.

- d. When the slope is greater than 1-vertical to 4-horizontal, step the ground to prevent wedging action against the structure.
- e. Use selected soil which will compact readily, if available.
- f. Silty soil should not be used.
- g. During backfill operations, displacement of wing or abutment walls may be checked by erecting a "telltale" before backfilling is started and checking the wall for movement as the backfill progresses. If movement is detected, backfill operations should be suspended and the Project Manager advised of the problem.

- 44. Watch for and report unstable and unanticipated settlement to the Project Manager and Materials & Tests Engineer.
  - a. Bulging at the toe of the slope.
  - b. Cracks running parallel to centerline are indicators of unstable embankment conditions.
  - c. Subsidence at bridge ends, excessive cracking inside box culverts or unanticipated swales are signs of excessive settlement.
  - d. Pumping action.

Foundation Engineer  
(479-4678)

@

- 45. Where surcharges are included in the plans as work to be accomplished during construction, the Soil Mechanics Section of the Materials and **Research** Division wishes to be informed before the beginning of the construction of the surcharge.
  - a. Construction progress and anticipated paving date may allow a change in the height of the surcharge necessary to complete the anticipated settlement.

Backfill:

- 46a. Confirm culvert backfill material meets specification requirements.
- 46b. Backfills on box and pipe culverts should be brought up evenly on both sides at the same time to avoid displacement of the structure.
- 47. When tamping under the lowest 90° of a culvert place elevation check stakes at the ends of the pipe to detect any rise.
- 48. The grade inspector should be alert to possible damage to any drainage structures which the contractor's heavy equipment may cause by crossing or working over such structures, and particularly to possible damage to pipe culverts covered with minimum fill.

- Field Book
- @
59. Field Book Entries
- h. Contractor's progress should be monitored to check that the work is being completed according to the construction schedule. Report major deviations.
  - a. Any supporting information or records necessary to facilitate the preparation of the required reports on sampling and testing (see Materials and Research "Earthwork Engineering Guide").
  - b. Calibration of distributor water tanks and of meter accuracy if the water is metered.
  - c. Daily record of water hauled (on large projects the water applied may be kept in a separate "water application notebook"). Include location (i.e., station of the excavation, borrow pit, embankment or surface) where water was applied and obtained.
  - d. Select placement, confirming information, etc.
  - e. Identify all work performed on the project by the contractor and subcontractor actually completing each pay item.
  - f. Make entries supporting extra work quantities.
  - g. Get the contractor representative signature agreeing to pay quantities in the entry.
- Measurement:
- @
60. Method of Measurement
- a. See CM Subsection 1300.04 for instructions to take cross sections. (Use Geopak when possible.)
  - b. Measure and pay authorized excavation of material below grade and overbreakage or slides.
  - c. Unsuitable material which is removed below grade in excavation areas, or below existing ground in embankment areas, is considered to be "authorized excavation of material below grade".
  - d. If the existing ground in an embankment area must be dried to such a depth as to be impractical to dry in place, the contractor may be ordered to undercut (excavate below grade) and haul this material to higher areas, drying and using it in the construction of embankment.
  - e. The volume of the undercut would also be considered to be authorized excavation below grade, and the volume measured and paid.
  - f. Larger quantity under cuts should be authorized by the District Construction Engineer and the volume should be measured by cross sections.



The Project Manager and the contractor may elect to measure areas in question and accept the remaining areas as "Established Quantities."

@ **Unsuitably Wet Material**

@ In low-lying areas and in wet soil contact zones, it **may be necessary** to declare most of the material as unsuitably **wet** at the direction of the Project Manager. A granular material that will drain can be used to replace the wet soil. An effort should be made to provide an outlet for water which may occur in the embankment or subgrade. Most wet soils that are removed can be dried and reused in some other area.

@ Soft shale, in some cases, can be moved in a manner similar to soil excavation. Shale cuts are usually benched and covered with topsoil in accordance with the plans. If unexpected shale is found, contact the Materials **and Research** Soil Mechanics Engineer. Slides can occur in backslopes of shale cuts, and flatter slopes may be required.

**Rock Material** (See *SSHC Subsection 107.08 and Section 206*)

If material to be excavated is too tough to be ripped, the Project Manager, contractor and a geotechnical specialist experienced in blasting should discuss the aspects of the work to be done.

**Contractor Furnished Borrow Areas** (*SSHC Subsection 205.03*)

On some projects, the contract documents will require a "contractor borrow." In these cases, the contractor is responsible for submitting a site approval request to the Construction Division (allow 60 calendar days for the Construction Division to obtain site approval from Nebraska agencies).

@ Construction Engineer  
Nebraska Department of Roads  
**1500 Highway 2**  
P.O. Box 94759  
Lincoln, Nebraska 68509-4759  
Fax No. (402) 479-4854

The approval request shall include:

- A Borrow Pit/Materials Pit Identification and Evaluation Form for each site.
- An aerial photo or topographical map showing the location of the pit site (one photo or map for each site).

No material will be removed from the site prior to the Project Manager's written approval of the sites.

The contractor shall also obtain a Corps of Engineers approval letter for the site and submit this to the Project Manager. The contractor shall submit a topographical map or a photocopy of an ASCS aerial photograph showing the exact location of the proposed pit sites to the Corps of Engineers. A legal description of the location should also be included.

Corps of Engineers  
Regulatory Branch  
P.O. Box 5  
Omaha, NE 68101-0005

ASCS aerial photos are available at county ASCS offices at a nominal cost. ASCS aerial photos cover agricultural ground only. In some instances, aerial photos of urban areas are not available from the ASCS.

Topographic maps may be obtained from the following source:

University of Nebraska  
Conservation & Survey Division  
113 Nebraska Hall  
Lincoln, NE 68588-0517  
Attn: Judy Otteman  
(402) 472-7523

**Approval For Soil Type** (Contractor furnished borrow)

- The Contractor will obtain soil samples to verify material is acceptable. The Project Manager will forward the samples to the Materials & Tests Office for evaluation. (See *SSHC Subsection 205.02.*)

**Preservation of Cultural Resources** (*SSHC Subsections 205.03 and 107.10*)

Cultural resources are the composite of archaeological and historic/architectural resources in an area. A common cultural resource site is a burial ground or remains of a Native American village.

Nebraska law requires action be taken to insure that cultural resources are not damaged or destroyed.

If a cultural site is discovered during construction, the contractor is required to temporarily discontinue work at the site. Upon discovering such a site, the Project Manager shall notify the Construction Office of the finding.

@

**Nebraska Game and Parks Commission Approval of Borrow Sites**

- All Contractor borrow sites must be submitted to the Nebraska Game and Parks Commission (NGPC) for approval. The NGPC will examine the proposed site for endangered plant and wildlife species and for potential Platte River drainage system depletion. This process can take 60 days or more.

@

## Borrow Pit/Materials Pit Identification and Evaluation

Project No.:		Date:
Project Location:		Control No.:
Requesting Contractor:	County(s):	
		Phone:

### Pit Size and Location

1. Pit Identification No.: \_\_\_\_\_
2. Identify the precise location of the pit (to 2.5 acres):  
 \_\_\_\_\_ ¼, of \_\_\_\_\_ ¼, of \_\_\_\_\_ ¼, of \_\_\_\_\_ ¼, of Section \_\_\_\_\_, T- \_\_\_\_\_ -N, R- \_\_\_\_\_ -
3. Attach a copy of an ASCS aerial photo and/or a copy of an USGS 1:24,000 scale topographic map precisely depicting the pit location.
4. Give pit dimensions (in feet) and orientation (NE-SW, etc.) for long axis (length), short axis (width) and depth.  
 Length:                      Feet: \_\_\_\_\_                      Orientation: \_\_\_\_\_  
 Width:                        Feet: \_\_\_\_\_                      Orientation: \_\_\_\_\_  
 Depth:                        Feet: \_\_\_\_\_
5. This is a:     Dry Pit     Wet Pit
6. Will this pit pond water when completed?     Yes     No
7. Pit location is owned by:     Private Owner                       Commercial/Business  
     State/County/City Government     Federal Government
8. Name of Owner: \_\_\_\_\_

### Pit Characteristics

1. Pit location is for:     Borrow     Material     Both     Other (Explain)
2. To your knowledge, has this pit location been used previously for borrow and/or materials?     Yes     No     Unknown
3. The pit location is presently used for:     Commercial Borrow/Materials                       Pasture  
     Row-Crop Agriculture     Stock Pond  
     Irrigation Recharge Pit     Urban/Suburban Residential  
     Stockpiled Borrow/Material     Other (Explain)
4. Vegetation cover is:     Grass     Trees     Weeds     Crops     Other (Explain)
5. Name, address, phone number of contact person, if additional information is required:

*Contractors requesting use of borrow or materials pits for Nebraska Department of Roads' construction projects need to identify their location and character on this form. Please fill in the blanks with the correct information or select appropriate answers to questions. Send the completed form to the Construction Division, Nebraska Department of Roads, PO Box 94759, Lincoln NE 68509-4759 or FAX to (402) 479-4854.*

Approval Block – For State Use Only	
<p style="text-align: center;"><b>Nebraska State Historical Society</b></p> Date received from the contractor: _____ Date submitted to NSHS: _____ Return due date: _____ Approval date: _____ Non-approval date: _____ Signature: _____	<p style="text-align: center;"><b>Nebraska Game and Parks Commission</b></p> Date received from the contractor: _____ Date submitted to NGPC: _____ Return due date: _____ Approval date: _____ Non-approval date: _____ Signature: _____

## Finishing

Finish grading must be completed on a timely basis so that erosion control measures may progress satisfactorily. Special provisions on many projects limit the surface area that the contractor may disturb. Generally, this area is 75,000 m<sup>2</sup> (90,000 square yards), excluding areas to be paved, plus an equal amount of clearing and grubbing area may be opened up. The Project Manager may increase these limits but only by written notice to the contractor. If used, this written notice should include justification for the increase and special procedures the contractor must use to safeguard the environment. Copies of this notice must be forwarded to the Construction Engineer and the District Engineer. 75,000 m<sup>2</sup> (90,000 square yards) is equal to approximately 1.6 km (1 mile) on an average two-lane, full grading project. Any repair required on sections that have been tentatively accepted will be considered extra work (unless considered to be the fault of the contractor) and if performed by the contractor they are entitled to additional pay as provided for in *SSHC Subsection 109.05*. Therefore, final cross sections may be taken on a section of grading after it is tentatively accepted per *SSHC Subsection 105.13*.

If the finishing work is not performed on a timely schedule, the Project Manager is advised to follow these progressive steps:

- Project Manager should notify the contractor of the concerns in writing.
- If this does not obtain results, suspend estimate payments.

@

## **Tentative Acceptance**

Areas that have been final graded may be accepted by the Department. However, do not accept an area until silt fence, cover crop, erosion checks, and other erosion control measures are in-place. Do not tentatively accept areas where the contractor must operate equipment to do other requirements. For example, shoulders and foreslopes should not be accepted until pavement and shoulders are finished. Ditch bottoms are a questionable area for tentative acceptance. Often, the Contractor plans to use material in the roadside ditch bottom to build the shoulder. In these cases, do not tentatively accept the ditch bottom until the shoulder work is also complete.

**303.00 SUBGRADE PREPARATION AND SHOULDER SUBGRADE PREPARATION**  
(See SSHC Section 302)

**303.01 CONSTRUCTION METHODS**

Since the performance of these items is accomplished to prepare the subgrade to support rigid or flexible pavement, and since the performance of either type of pavement is strongly affected by the moisture and density conditions of the subgrade at the time of placement of the pavement, the inspection of work under this subsection is of the highest importance. While staying within the Specification moisture and density limits, the following points should be kept in mind:

- In order to achieve high subgrade strength for flexible pavements, soils should have high densities and low moisture contents.
- In order to avoid differential swell in subgrade below rigid pavements, soils should have lower densities and higher moisture contents.
- In order to avoid roughness due to differential heave, subgrade soils should have uniform moisture and densities.

Studies have shown that a wide range of moistures and densities may be found in subgrades thought to be uniformly compacted to the satisfaction of the construction inspectors. It is believed that this lack of uniformity may to some extent be due to the tendency to take samples in locations thought to be representative (thus actually being a median condition) rather than taking samples at random locations. See *Materials Sampling Guide* for directions on how to sample the subgrade.

@ Another problem which may result in improper moisture and density control is the erroneous identification of the soil type. A review of the Materials and Research "Earthwork Engineering Guide" is recommended.

Settlement of shoulder pavement relative to the driving lanes and a resulting maintenance operation to eliminate a drop-off condition is quite common. Extra care in compaction of subgrade adjacent to the pavement edge is necessary to alleviate this problem area.

The item of work "Subgrade Preparation" is designated as the procedure to be followed in preparing the grade on projects where the surfacing will be constructed.

It is particularly important to test the portion of the roadbed which will underlie the outer edges of the surfacing. Frequently, this portion of the roadbed will be found to be high in moisture content and have less than satisfactory density due to freezing and thawing or lack of traffic compaction. If the moisture or density of this outer portion is less than satisfactory, difficulty may be experienced in properly constructing and compacting the overlying pavement.

This work provides for adjusting grade lines, scarifying, drying, shaping and compacting of the upper 150 mm (6 inches) of the roadbed ahead of surface or base construction. The moisture and density requirements will be shown in the plans.

The Specifications require that the correction of failures below the upper 150 mm (6 inches) of the subgrade will be performed on an "Extra Work" basis.

**304.00 SUBGRADE STABILIZATION (SSHC Section 303)**

**304.01 DESCRIPTION**

The principal function of subgrade stabilization is to provide a stable grade for subsequent construction.

**304.02 MATERIAL REQUIREMENTS**

@ See the Materials and **Research** Sampling Guide for sampling and testing requirements.

**Obtaining Materials From Local Pits**

In general, the contractor must obtain all off site pits and close them with the landowner. The Department no longer tracks site releases for contractor provided pits.

**304.03 EQUIPMENT**

The inspector should carefully check the contractor's equipment and calibrations. Pay quantities and other important measurements may be based on some of the equipment and we need to make certain that they conform to the requirements of the Specifications and the special provisions.

**304.04 CONSTRUCTION METHODS**

This item consists of the stabilization of non-cohesive sand by the addition of a natural soil binder material. In order to insure satisfactory performance of the overlying pavement, especially if it is of the flexible type, the following points should be kept in mind:

1. Silt clay soils exhibit poorer support for pavement if they exist as thin layers over pervious sands than if they comprise the full depth of the subgrade. For this reason, the placement of a thin soil binder layer over the sand should be prohibited.
2. The minimum amount of soil binder required to support construction operations should be used. An excessive amount of binder causes the mixture layer to act as a silt-clay layer as in 1 above.
3. Thorough mixing of sand and soil binder is conducive to good performance.
4. A stabilized subgrade will allow paving equipment to travel over sandy areas.

**305.00 EARTH SHOULDER CONSTRUCTION (SSHC Section 304)**

**305.01 DESCRIPTION**

Shoulder construction when included in the plans and contract shall be constructed in accordance with *SSHC Section 304*. Very often there are also special provisions included in the contract that pertain to specific problems anticipated in the shoulder construction of the project. The inspector and Project Manager should be certain that the special provision requirements are followed.

**305.02 CONSTRUCTION METHODS**

- I. Signs, delineators, mailboxes and guardrail will usually need to be removed from the areas where the contractor is required to perform this item of work. Department maintenance forces may be required to move the signs, delineators, and guardrail. There generally will be instructions in the contract stating the disposition of the delineators and guardrail and who is responsible for the relocation. The mailboxes should be moved by the owner. It is a good policy to discuss the anticipated conflicts affecting mail deliveries with the postmaster for the area before actual construction begins. The Project Manager or inspector will have to contact the mailbox owners and coordinate the relocation of these mailboxes so that inconveniences will be held to a minimum for all parties involved. The Department's or contractor's employees should not move these mailboxes except with the permission of the owners. If the owners will not cooperate, the postmaster for the area should be contacted.

- II. Safety and protection of the highway user is a prime concern. The Standard Plans require plastic barrels if the drop-off at the edge of the traveled way is more than 50 mm (2 inches).

Certified flaggers are required when the normal flow of traffic must be interrupted. All slow equipment as defined in the Nebraska Rules of the Road shall display the slow moving vehicle emblem and have strobe or flashing yellow beacons. The contractor must erect and maintain all the required signs and barricades in the correct positions to protect and warn the motorists. The Project Manager should take photographs and video tape the construction zone to document conditions.

- III. The inspector shall take sufficient measurements and make sufficient observations to confirm that the shoulders have been constructed in reasonably close conformity with the typical section and the material requirements specified. These conforming checks shall be recorded in a bound field notebook. One check per 1.0 km (1/2 mile) highway centerline distance shall be the minimum number of checks required.

- IV. **The time limitations imposed by the Specifications in Table 304 and Subsection 304.03 on placing the shoulders should be enforced. The tally of days (internal) charged against the shouldering must be shown on the weekly working day report.**

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**305.03 METHOD OF MEASUREMENT**

Plan stationing may be used for computing shoulder construction except in cases where apparent errors in stationing are discovered and the correct stationing is to be used.

Calibration of water measuring equipment is discussed in the *SSHC Section 205*.

Note in the *SSHC Subsection 304.04* that shoulders are measured by the station and each shoulder is measured separately without regard to width and depth.

- Do **not** change the sign color combination
- Do **not** reduce sign size or alter sign shape

Field adjustments can be made, if necessary, in the following areas **without** Traffic Engineering Division notification and concurrence:

- Individual sign locations may be adjusted up to a maximum of 60 m (200 feet) as long as no two signs, either permanent or temporary, become closer than 60 m (200 feet) apart. Removal, covering, or adjusting of permanent signs in the vicinity of construction work zones should be coordinated with maintenance. Adjustment greater than 60 m (200 feet) must be approved by the District Construction Engineer.
- Paired signs may be adjusted a maximum of 60 m (200 feet).
- Taper location, sequencing arrow location, and corresponding lane merge signs may be adjusted up to 150 m (500 feet) away from construction work area. This is appropriate with poor advance sight distance due to hills or curves, or when earlier detection of a sequencing arrow is needed.

#### **404.03 CONSTRUCTION ZONE ACCIDENT REPORTING**

Prior to the start of construction, the District Construction Engineer (DCE) will notify in writing the appropriate Nebraska State Patrol office of the project location and scope. This correspondence should identify location, construction dates, and other pertinent construction project data including names and phone numbers of responsible contact persons from contractor and District Office in case of accident or other construction work zone problems.

If the Nebraska State Patrol determines the NDR needs to make immediate repairs at a construction work zone accident site, the investigating officer will contact the appropriate District office. The DCE will evaluate the request and advise the PM as to what action to take. The Project Manager will then inform the contractor's representative of needed corrective action. When construction work zone accident site does not require immediate corrective action by NDR or contractor representatives, the investigating officer is to report accident to the Project Manager within 12 hours.

##### **Investigation Procedure**

When an accident occurs within a construction work zone, the Project Manager will complete DR Form 100 "Construction Zone Accident Report". The report should include pictures, diagrams, traffic control, weather conditions, and other pertinent information as appropriate. Attach a copy of any accident report by other agencies (highway patrol, county sheriff, or city police). Also, attach photographs and a video tape (whenever possible) of the accident site showing location of traffic control devices and other pertinent items.

For accidents resulting in property damage to NDR facilities, the Project Manager shall identify repair costs on DR Form 11, State Property Damage Report. This form is initiated by the **Traffic Engineering** Division. An example is damage to new guardrail on a staged bridge construction. The District should identify work status when completing the report. Repair costs and supporting documentation should be submitted on the form. An

@



approved extra work order can be attached to the form to document costs in lieu of completing that part of the form.

@ The ORM form, Vehicle Accident Report, and the DR form 41, Driver's Motor Vehicle Accident Report shall be completed within 10 days and should be forwarded to the **Traffic Engineering** Division, State Property Damage Coordinator, 479-4645.

### **Accident Notification Procedure**

The NDOR or contractor staff should report construction work zone accidents to appropriate enforcement authorities (usually Nebraska State Patrol for NDR administered projects) and notify appropriate medical responders if needed. Both the inspection supervisory staff and contractor supervisory staff should be notified promptly. Note additional reporting procedures for severe personal injury or fatality accidents.

### **Reporting of Severe Personal Injury and Fatal Accidents**

If an accident results in a severe personal injury or fatality within a NDR administered construction work zone, immediately notify the Construction Division, District Construction Engineer, and Traffic Engineering Division.

Additional information to be gathered and forwarded by FAX within one working day to the Construction Office, and Traffic Engineering Division includes:

- Project Number
- County
- Route Number
- Direction
- Milepost
- Date of Accident
- Time of Accident
- Contractor
- Traffic Control Required in the Contract Documents
- Approved Traffic Control Modifications
- Brief Description of Facts Surrounding Accident  
(Do not include hearsay, assumptions, or unsubstantiated facts.)

## **404.04 STOP SIGNS ON CONSTRUCTION PROJECTS**

Particularly during grading activities, the need arises to frequently move stop signs as intersections are staged to allow access into project corridor. Instructions regarding the placement of stop signs during grading activity are as follows:

- Existing stop signs should be left in place until work in that area necessitates removal. If an intersection does not have an existing stop sign, the appropriate maintenance area supervisor should be notified to install a stop sign immediately. All side roads to primary highways must have a stop sign unless the side road is physically closed.
- At the time work progresses to the point that existing stop sign is no longer in the proper location or in the way of construction activities, the stop sign should be removed by NDR Maintenance. A temporary stop sign with a minimum size of

### Special Concerns

When temporary traffic signals are involved, the contractor shall arrange for emergency maintenance services. No payment will be made to contractor.

On urban projects, DCE will need to coordinate with the city to determine who is responsible for access, signing, and safety features.

#### 404.09 **FLAGGERS & PILOT CARS** (*SSHC Section 422*)

The Department, in conjunction with the AGC, has made the Flagger Certificate quiz, the Flagger Training video, and a Flagger Training audio cassette available in Spanish.

The availability of this material in Spanish in no way is meant to void the specification that requires that flaggers read and speak English clearly. However, in recent years the number of Hispanic workers on our construction projects has increased. The intent is to provide better education to those whose native language is Spanish, realizing that while they may be able to speak English clearly they may have difficulty learning and taking a test in English. You could relate it to learning metrics. While we know and talk metric, few of us really think in metric.

The flagger on a construction project is the first line player in communicating with the driving public. It is imperative that the flagger be able to speak English clearly with the drivers in a work zone. The contractor is responsible for insuring that anyone performing flagging can meet these requirements.

@ **Flaggers may wear the company's hard hat no matter what color it is.**

#### **Flagger Bid Item**

If the contractor's flagging crew (irregardless of crew size) works four hours or less, then ½ flagger day is charged. If the crew works more than four hours, then one flagger day is charged.

#### **Slow/Slow Paddles**

The Flagger Handbook indicates that when a flagger is used near the lane-line to warn public traffic of workers and equipment close to the open lane, then these flaggers are only allowed to use a "slow/slow" paddle. This paddle shall be 0.6 m (24 inches) diamond shaped with the word "slow" in black letters on orange background on both sign faces. The standard stop/slow paddle shall never be used on a multi-lane highway, since through traffic should never be forced to stop on these roadways.

@ **Permanent & Temporary Pavement Marking**

**Pavement moisture can be measured by placing and holding a two square foot piece of clear plastic on the existing pavement for a period of 15 to 20 minutes. Remove and hold the plastic in a vertical position. If water drips from the underside of the plastic sheet, the pavement has excess moisture.**

### **Raised Pavement Markers** (SSHC Section 422)

Many interstate or other complex project traffic control plans include the use of raised pavement markers to supplement the temporary pavement markings for the project. Raised pavement markers are used in lane shifts or at crossover location to enhance visibility of correct travel path through these areas. Raised pavement markers are very effective if they stay in the correct location on pavement surface.

Off-tracking rear wheels on semi-trailers often dislodge raised pavement markers from the pavement surface. It is permissible to offset the location of the raised pavement markers up to 300 mm (1 foot) laterally away from the temporary pavement marking line to avoid the off-tracking rear trailer wheels.

#### **404.11 CHANGEABLE MESSAGE SIGN GUIDELINES** (SSHC Section 422)

The Department owns changeable message signs (CMS) stored at various locations statewide. These CMS units are intended to be used for incident management traffic control for major interstate reconstruction, emergency response, temporary road closures for bridge beam replacement, temporary utility crossing requiring road closure, and for other emergency related road closings.

CMS units used for incident management traffic control for major interstate reconstruction projects should have the word message approved by the Traffic Engineering Division, since the appropriate message will vary from project to project. CMS units used for all other situations should also have the word messages approved by the state traffic engineer.

Proposed word messages should be limited to a maximum of 2 panels and usually eight words or less per panel.

CMS units used for project purposes will be under control of the appropriate maintenance office. Repair costs for CMS units used for project related incident management can be charged against project funds using the appropriate documentation.

#### **404.12 FLASHING ARROW PANELS**

@ A listing of currently approved flashing arrow panels is found in the NDR Approved Products List. Manufacturers of flashing arrow panels not currently approved for project use may contact the Materials and **Research** and Traffic Engineering Divisions to schedule a field review for inclusion in the NDR Approved Products List.

Any flashing arrow panels approved prior to January 1, 1996 must be resubmitted for approval under the new MUTCD requirements.

@ If any solar arrow panel fails to perform adequately in a field situation, it shall immediately be removed and replaced with a diesel powered arrow panel. The Materials and **Research** Division and Traffic Engineering Division should be informed if any approved solar arrow panel fails to perform adequately so that the deficient arrow panel model can be dropped from the NDR Approved Products List.

### **Speed Limits in Construction Work Areas**

The maximum speed limit through any construction and maintenance work area shall be 35 mph in rural areas and 25 mph in urban areas, provided signs are in place to give notice of the speed limit.

- @ The **Director** may raise the 35-mph speed limit in rural areas and the 25-mph speed limit in urban areas, or may delegate the authority to raise the speed limits to Department of Roads' employees in a supervisory capacity. The speed limits shall be raised in 5-mph increments, and cannot exceed the statutory speed limits.
- @ Speed limits above 35 mph in a rural area and 25 mph in an urban area will be effective when the **Director**, or any officer to whom authority has been delegated, gives a written order for the increase and signs identifying the speed limit are displayed.

Speed limit signs may be mounted on a fixed or movable stand. For a moving-type operation, speed limit signs may be mounted upon moving Department of Roads' vehicles.

### **Authorization**

In order to raise the work area speed limit from 35 mph in rural areas and 25 mph in urban areas, the authorized supervisory employee shall complete a Speed Zone Authorization form identifying the speed limit, highway number, location, and starting and ending times that the speed limit will be in effect. The original Speed Zone Authorization form should be kept in the file of the individual signing the authorization. A copy of the Speed Zone Authorization should be forwarded to the individual in charge of the work crew.

The establishment of speed limits through construction work areas will be determined in the Lincoln office, and will be included in the contract provisions so that a contractor will be aware of a construction speed limit while preparing his/her bid.

- @ If a situation arises where a construction speed limit is needed during the course of a construction project and no provision was made for the speed limit in the contract provisions, or if a speed zone established through the contract provisions needs to be raised or lowered, individuals designated by the **Director** may establish or alter speed limits in accordance with these guidelines.

### **Signing (SSHC Section 422)**

All signing shall conform to the requirements of the *Manual on Uniform Traffic Control Devices*.

Speed limit signs are intended to supplement normal work area signing. They are not intended to replace any of the signs that are now being used, except under certain situations where advisory speed plates are used.

In order to make the "Double Fines" enforceable, the "FINES FOR SPEEDING DOUBLED IN WORK ZONES" sign must be posted at the beginning of each work zone. On all speed limit signs, the "FINES DOUBLED" sign needs to be installed, except for 35 mph in rural areas and 25 mph in urban areas, must be set by utilizing the authorization form. If, for example, within the limits of an interstate construction project, there are two sections under

## Speed Zone Authorization

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Pursuant to the authority contained in Section 60-6,188 Reissue Revised Statutes of Nebraska, and in accordance with Authorization No. \_\_\_\_ issued on July 19, 1996 by the **Director**, the maximum speed limit of 35 miles per hour in rural area, or 25 miles per hour in an urban area through highway maintenance, repair or construction zones on the portion of the state highway system, has been increased as set forth below.

Highway No.: ..... Location: .....

Ref. Post: ..... To Ref. Post: .....

Project No. (if applicable) .....

The **prima facie** speed limit shall be increased from \_\_\_\_ miles per hour to \_\_\_\_ miles per hour, this increase maintains the same posted speed limit as the speed limit prior to work for the entire length of the work zone, and will be in effect 24 hours a day, except as changed below.

The following **prima facie** speed limit for sections of the work zone shall be increased from \_\_\_\_ miles per hour to the speed shown below, and shall be in effect only when standard signs giving notice thereof are installed as provided by law, for the lengths and time periods as set forth below.

**Work Zone Section One:** \_\_\_\_ **Miles Per Hour** Activity: \_\_\_\_\_

Transition Speed Zone Required (y/n) \_\_\_\_\_ if Yes, Transition Zone - \_\_\_\_\_ Miles Per Hour

Stationary \_\_\_\_\_ Sta. or To: \_\_\_\_\_  
(Longer than 3 Days) Ref. Post: \_\_\_\_\_ Ending Date: \_\_\_\_\_

Starting Date: \_\_\_\_\_ Ending Date: \_\_\_\_\_

24 Hours (y/n) \_\_\_\_\_ or Daily, Start Time: \_\_\_\_\_ End Time: \_\_\_\_\_

Non-Stationary \_\_\_\_\_ Actual Starting and Ending Locations, Dates, and Times will be documented  
(Less than 3 Days) in a daily log.

**Work Zone Section Two:** \_\_\_\_ **Miles Per Hour** Activity: \_\_\_\_\_

Transition Speed Zone Required (y/n) \_\_\_\_\_ if Yes, Transition Zone - \_\_\_\_\_ Miles Per Hour

Stationary \_\_\_\_\_ Sta. or To: \_\_\_\_\_  
(Longer than 3 Days) Ref. Post: \_\_\_\_\_ Ending Date: \_\_\_\_\_

Starting Date: \_\_\_\_\_ Ending Date: \_\_\_\_\_

24 Hours (y/n) \_\_\_\_\_ or Daily, Start Time: \_\_\_\_\_ End Time: \_\_\_\_\_

Non-Stationary \_\_\_\_\_ Actual Starting and Ending Locations, Dates, and Times will be documented  
(Less than 3 Days) in a daily log.

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*Authorizing Authority (Signature)*

*Title*

*Date*

cc: District Office  
Nebraska State Patrol  
County Sheriff

## DIVISION 500

### BITUMINOUS PAVEMENT

#### 501.00 ASPHALT PAVEMENT CHECKLIST

*SSHC References:*

<i>Section</i>	<i>503</i>	<i>Asphalt Concrete Pavement</i>
	<i>1028</i>	<i>Asphalt Concrete</i>
	<i>1033</i>	<i>Aggregates</i>

Inspection Crew:

- Plant Inspector
- Laydown Inspector
- Lab Inspector

Inspection Equipment:

- Nuclear Density Gauge
- Thermometer (Surface)
- Thickness Ruler
- 3 m (10 foot) Straightedge
- Cleaning Solvent
- Insulated Container
- Gravel Sampling Bags
- Paper Sacks
- 1.3 m (4 ft.) Carpenter Level
- Performance Graded Binder** Sample Cans

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@

Inspection Procedures:

1. Review all Plans, Specifications, Road Standards, Materials & **Research** Manuals/guidance and the *Construction Manual*. Prepare field books.
2. Check traffic control, work zone length, flaggers, signing, pilot car operations.
3. Check project quantities to insure accuracy.
4. Are asphalt concrete mix designs approved?
5. Obtain necessary inspection equipment and review sampling and testing procedures and frequencies.
6. Locate and reference fixtures to be adjusted prior to placing final layer.
7. Does equipment meet requirement of *SSHC*:
  - Trucks
  - Tampers
  - Rollers
  - Material Bins
  - Weighing Equipment
  - Distributors

22. Are proper number of trucks available for continuous paving?
23. Compare paver speed to plant output to reduce amount of stopping. (*SSHC Subsection 503.04*) Consistent speed results in more consistent pavement properties.
24. Check width, depth, and cross-slope, and compare to spread width typical and typical section as per plan.
25. Check and record yield based on megagrams (tons) of mix required compared to megagrams (tons) of mix used. (Recommend 2-hour intervals)
26. Is gradeline string accurately set and maintained? (*SSHC Subsection 503.04*)
27. Are transverse and longitudinal joints constructed properly? (*SSHC Subsection 503.04 and Construction Manual 502.40.3*)
28. Is surface texture uniform, dense, and free from irregularities, tearing, steel roller marks, check cracks, solvent spots, and segregation? (*SSHC Subsection 503.04*)
29. Check smoothness (*SSHC Section 502*) with 3 m (10 foot) straightedge when profilometer smoothness (*SSHC Section 502*) is not required.
30. Are temporary runouts and fillets in compliance with applicable standards?
31. Obtain required **performance graded binder** samples. Obtain tack samples if required.
32. Mark original and any recut core locations and observe core sampling. Be sure core holes are properly filled. May use nuclear density gauge to check density.
33. Think safety! Use proper equipment, wear protective clothing, and be aware of contractor's operations.
34. Is the established rolling pattern being maintained and documented? (*SSHC Subsection 503.04*) Are asphalt concrete properties in the test strip determined to be acceptable prior to proceeding?
35. Do shoulder rumble strips conform to the Plan details? Check indentation depth and alignment of strip.
36. Do drop-offs comply with plan details?
37. Has grade and alignment staking been completed and checked?

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Construction Critical Areas:

1. Asphalt should not be heated to more than 175°C (350°F) in the plant.
2. Asphalt at laydown should be 115 to 160°C (240 to 320°F).
3. Watch joints to make sure they close tightly and attain proper density. Tack vertical face of joints.

Safety Areas:

1. Maintained Traffic:
  - a. Keep Contractor vehicles behind pilot car.
  - b. Flaggers should use proper procedures.
2. Watch for trucks and loaders traveling at an unsafe speed.
3. Electrical cords near plant must be safely used.
4. All work must comply with OSHA and other applicable safety requirements.

NDR Tests:

1. Nuclear Density Gauge Procedures  
NDR T 238 & T 587
2. NDR T 99 Soil Density

@ Sampling Requirement/Freq.:  
*SSHC Subsection 1028.02*

1. **Performance Graded Binder**
  - a. 1 L/Day and 1 L/**3400** Mg of mix (1 qt/day & 1 qt/**3750** tons).

@

2. Asphalt Concrete
  - a. Density Cores: 1/**680** Mg; 5 cores/**3400** Mg Lot (1/**750** tons; 5 cores/2750 ton lot)
  - b. Thickness Cores: (See contract Special Provisions.)
  - c. Mix Properties: 1/1000 Mg (1/1100 tons)

Inspector's Records & Forms:

1. Profilogram
2. DR Form 143 - Pavement Marking Report
3. DR Form 261 - Daily Report of Cores Drilled
4. DR Form 295 - Summary of Quantities and Location of Surfaced Intersections and Driveways
5. Density Pay Factor Summary (DR Form 173 or equal)



**502.00 ASPHALT PAVEMENT**

**502.10 ASPHALT PAVEMENT DESCRIPTION**

This Subsection explains how to inspect and monitor quality controlled asphalt paving operations. It includes monitoring plant preparation of the asphalt mix and laydown procedures.

**502.20 ASPHALT PAVEMENT MATERIAL REQUIREMENTS**

**502.20.1 ASPHALT ACCEPTANCE AND TESTING**

**Field Tests and Certification of Materials**

Sampling and testing are required to determine whether the quality of materials and construction are in reasonably close conformance with the plans and Specifications.

Project inspectors shall monitor all materials received on a project before they are incorporated into work. Inspectors shall determine that proper inspection reports or certifications are on hand, and that no unusual alterations in characteristics of materials due to handling or other causes occurred.

Schedules in the *Materials Sampling Guide* contain various field tests and sampling frequencies for asphalt materials and mixtures.

The QA/QC program was started in 1993 with the goal of improving the overall quality of asphalt produced and giving the contractor the responsibility for mix design, sampling, testing, and making mix adjustments. In other words, contractors were given responsibility for the product they produce. If needed, most administrative questions involving QA/QC projects can be answered by referring to the Flexible Pavement Engineer [(402) 479-4675].

**Asphalt Materials**

Acceptance of asphalt materials will be on the basis of test results or certification from an approved source. Formal approval of a source is to be issued by the Materials and **Research** Engineer.

@

Each shipment invoice covering asphalt materials delivered to a project shall have a signed certification statement as to type and grade, specific gravity or mass per liter, load quantity, batch number or other identification, and project number. A copy of this invoice shall be furnished to Project Manager or project inspector for review and filing.

@

The Project Manager must have documentation of the following:

1. Performance Graded Binder
2. Aggregates
3. Asphaltic mix taken behind the paving machine but in front of the rolling operation.
4. Asphalt in-place density.

Performance graded binder suppliers are grouped into two categories (levels).

1. Level-1 suppliers are certified suppliers who have submitted documentation to the Department and as part of the certification process, the Department has inspected the supplier's plant.
2. Level-2 suppliers are approved suppliers that are not certified.

The difference between being level-1 and 2 is that level-1 suppliers are only verified every other day while level-2 suppliers must be verified each day. This verification is between the lab and the supplier and the PM is not involved.

Hot-In-Place asphalt work may require support from the lab. Make sure you notify the lab at least 2-3 days in advance so they can plan to be on-site when the work begins.

Density of the in-place mix can be tested with the nuclear density gauge or by taking cores and measuring the density of the cores. Do not use the contractor's random sampling tables. Use the Department's tables and keep location secret.

## Aggregates

Aggregate gradation and characteristics are covered in detail by *SSHC Section 1033*. Acceptance for quality will be based on source monitoring and test results on assurance or project samples.

### 502.20.2 RESPONSIBILITY AND DOCUMENTING ASPHALT MIXTURE PROPORTIONING CHANGES

*SSHC Section 1028* explains how asphalt mixtures will be controlled. It establishes job mix criteria and corrective procedures to be followed when mixture characteristics are changed from the job mix formula during mix production.

@ On QA/QC projects, the contractor has sole responsibility for making mix changes; however, the Materials & Research Engineer and Project Manager must be kept informed and involved in these changes. Mix change decisions must be an interactive process between the contractor and the Department.

The Project Manager must also insure that required changes are implemented by the contractor as soon as possible when mixture characteristics fall outside *SSHC Section 1028* limits. **On each working day, the Project Manager shall determine if work for previous working day was within SSHC guidelines.** If not, immediately consult with the contractor and ask what corrective actions have been or will be made. Contact Flexible Pavement Engineer if additional guidance is needed.

@

#### Adjusting Asphalt Cement Contents

On QA/QC projects, job mix control is the contractor's responsibility. The contractor is responsible for sampling, testing, reporting results, and making appropriate mix changes. Also, testing is done up to four times per day at each asphalt plant site so immediate results are available.

@ When test results for air voids of plant produced mix are outside the limits given in *SSHC Section 1028*, the contractor needs to contact the Project Manager and initiate changes in the asphalt mixture. **The contractor's first efforts at corrective action should be to adjust the aggregate percentages as needed. The adjusting of the performance graded binder content should not be the first step because when performance graded binder content changes are considered to adjust air voids, caution must be used to assure that adequate film thickness is maintained. Reductions in performance graded binder content must not go below the minimum allowable performance graded binder content as calculated in SSHC Section 1028. Documentation of changes should be on the contractor's "Daily Plant Report."**

@

#### Documenting Corrective Action for Noncomplying Air Voids Test on Specimens Taken from Constructed Pavement

*Materials Sampling Guide* also requires the contractor to report tests for field air voids on mix samples from behind the paver on the contractor's "Daily Plant Report."

If conflicts develop between the contractor's and the NDR'S field voids, then together the contractor and the Department should concentrate on achieving proper voids and resolve the conflicts.

@ When noncomplying tests for air voids in specimens taken from constructed pavement occur, the Project Manager will notify the Materials and **Research** Asphalt Lab [(402) 479-4757] if it cannot be corrected. The contractor and the NDR plant inspector will document noncompliance on the contractor's "Daily Plant Report" containing the noncomplying test results.

In response, the contractor will inform the Project Manager as to what changes in mix proportions, if any, should be made. The contractor will furnish project personnel written documentation for the decision or action taken.

### **Adjusting Aggregate Proportions**

Contractor must occasionally adjust aggregate proportions to consistently comply with the contract provisions and to correct calibration errors.

Contractors shall initiate and make changes necessary to insure compliance to *SSHC Sections 1028 and 1033*. The contractor shall document all changes being made.

Proportion changes which exceed provisions of the contract may require a new mix design unless waived by Project Manager.

Project Managers and inspectors need to be familiar with the contractor's QC program because it should provide many of the guidelines needed for making mix change decisions. Project Managers are expected to reference *SSHC Section 1028* and communicate with Materials & **Research** if needed prior to, during, and after the contractor makes decisions concerning mix proportion changes.

@

Proportion changes shall be documented by the contractor on their "Daily Plant Report."

### **Filler-Bitumen Ratio**

@ *SSHC Section 1028* defines the filler-bitumen ratio. Filler-bitumen is the ratio of material passing the 75  $\mu\text{m}$  (#200) sieve divided by percent of **performance graded binder** in the mix (i.e., tank sticks, etc.).

@ **The** Plant inspector should determine if and by how much a contractor proportion change will affect the filler-bitumen ratio. If it is necessary, contact Materials & **Research** Asphalt Lab [(402) 479-4757] for guidance.

## **502.20.3 ASPHALT REPORT FORMS**

Construction inspection personnel are responsible for monitoring/assisting in field sampling and testing in accordance with requirements of *SSHC* and those outlined in the *Materials Sampling Guide*. Forms are supplied for reporting test results, submitting samples, and as inspector work sheets.

Under the certified plant inspector program and Quality Assurance/Quality Control (QA/QC) program, specific sampling and testing will be done by the contractor's representative per *SSHC Section 1028* and the *Materials Sampling Guide*. Plant

inspectors and the contractor's QC technicians must also be familiar with all applicable specification requirements including the sampling and testing procedures.

### Form Identification and Use

- Daily plant operation, job control testing, and material placement for asphalt production are recorded in the field book or project records. Copies of the contractor's reports shall be sent to Materials & Research Engineer and the Project Manager.
- DR Form 12, "Sample Identification Form" must accompany all samples submitted to central materials laboratory and District materials laboratories.
- A mix design letter from the contractor and approved by the Flexible Pavement Engineer is used to define aggregate components of asphalt, to identify material sources, gradation, production limits, and proportions for the asphalt mix designs.
- "Summary Form of Tests of Asphalt Mixtures" is to be used by District materials laboratories to report extraction, sieve analysis, density, voids, maximum specific gravity, etc.

The contractor will use NDR forms for plotting all moving average data, various temperatures and other graphed data.

Although submission of a daily report is not required, it is necessary that each day's production information be recorded in the field notebook. It is very important that the daily placement be identified by station location, side, lift, lift thickness, and material characteristics. This type of information becomes necessary in case of deductions or answering inquiries regarding any traffic accident occurring on the project.

## **502.30 ASPHALT PAVEMENT EQUIPMENT**

### **502.30.1 INSPECTION AT ASPHALT PLANTS**

Project Managers are responsible for verification, inspection and/or monitoring at asphalt plants. They should assure themselves that the contractor's QC inspectors are qualified and have been informed about their specific duties. This should include, but not be limited to, frequency of tests, information to be recorded, and samples to be obtained and held for use by Materials & Research and District laboratories.

@

The contractor is responsible for all plant inspections. Their duties include constant checks of stockpile handling, equipment settings, mixture appearance, and supervision of scale inspectors and assistant plant inspectors. Plant inspectors should spend part of their time in the laboratory trailer, and assist as needed.

The contractor shall furnish and be responsible for certified plant inspection in accord with *SSHC Section 1028*. All asphalt production, including patching, will be covered by certified plant inspection unless otherwise excluded by contract documents or when 450 Mg (500 tons) or less of asphalt are used on project. Plant monitor requirements are identified in *SSHC Section 1028*.

On QA/QC projects, the contractor's QC lab technician is responsible for meeting all sampling, testing, and documentation requirements as set forth by the current contract. For some contractors, this person may also be responsible for certified plant QC inspector duties as well. It should be possible for two people to handle both QC and Plant Inspection responsibilities on a typical asphalt resurfacing or paving project. The QC technician should maintain good communication with the NDR inspector and Materials & Research personnel especially on test results and mix changes.

@

### **502.30.2 INSPECTING THE MIXING TIME OF ASPHALT PLANTS**

Project Managers should insure that mixing time is inspected on continuous plants and on batch plants.

Necessary action shall be taken to insure compliance with the mixing time in *SSHC Subsection 503.03*. Inspectors shall check mixing time when work begins on the project and thereafter as they consider necessary to insure compliance. The QC inspector's diary must show when it is done and calculations used.

If mixing time is found to be deficient, the contractor shall increase it to a specified amount. For continuous plants, this is done by decreasing the megagrams of output or by increasing pugmill contents.

@

Materials & Research personnel will give assistance in determining the mixing time as a component of the plant calibration process.

### **Mat Smoothness Machine**

This is an asphalt material receiving hopper and elevator that deposits hot asphalt into paver hopper. Use of this equipment allows for a more consistent paver operation by providing some surge capacity for paver, only on a much smaller scale than the MTV.

Its mass is approximately 8,500 kg (10 tons) empty and has a hopper capacity of 1.7 m<sup>3</sup> (60 ft<sup>3</sup>). Mass restrictions are not a concern with this piece of equipment.

Advantages for use of MTV and CR MS-3 include:

- Smoother pavements due to elimination of trucks backing into paver and ability to provide a more uniform operation speed.
- @ • Reduction in potential for truckload **interval** segregation due to amount of mixing the material receives going through this equipment.

Even with the MTV or CR MS-3, paver hopper should be kept relatively full at all times. If hopper is allowed to drawn down too far, coarse aggregate collected in sides of paver hopper might be drawn down and create streaks of segregation in mat surface.

### **Windrow Pick-up Equipment**

With this process, hot asphalt is deposited in a windrow onto pavement surface using bottom dump trailers. A windrow pick-up elevator deposits the material into paver hopper. Again, primary advantages are contractor efficiency and uniform speed of operation.

Segregation has occurred on several projects on which this equipment was used. Truckload and longitudinal strip type segregation are potential problems with this equipment.

All material deposited onto roadway must be picked up and put through the paver. Material left on roadway will cause surface problems following completion of project.

expense. Overdepth aeration and recompaction below the top 150 mm (6 inches) shall be paid for as extra work (*SSHC Subsections 302.03 and 503.04*).

When repair, drying, and recompaction are required to correct damage from contractor's operation, all necessary repair will normally be done at the contractor's expense. However, if the Project Manager determines that additional depth of aeration and recompaction are needed, that should be paid as extra work (*SSHC Subsection 302.03*).

### **Special Treatments**

When unusual problems are encountered with unstable subgrades or subbases, the District Engineer should contact Materials & **Research** for assistance.

@

## **502.40.2 GRADELINE STRINGS AND EDGE ALIGNMENT**

### **New Construction**

The inspector should make frequent measurements to insure the guideline string has been correctly set and maintained. Support arms used to secure the guideline string shall be at intervals close enough to minimize chords on curves and other irregularities. Make the curve look like a curve.

Guideline strings placed on two-lane asphalt pavement should be located by measuring from redhead nails placed on centerline. Placement of a lower asphalt layer will cover redheads. For succeeding lifts, guideline string should be located by measuring from exposed nails used to hold string for each previous lift.

### **Resurfacing**

When resurfacing two-lane PCC pavement, contractors may locate guideline strings on shoulders along outer edges. To insure that parallel alignment is used for an adjacent lane, the gradeline string for that lane shall be located by measuring across pavement from the first string.

True edge alignment controls the correct lap at each longitudinal joint. If insufficient lap, the joint will lack density resulting in raveling and joint deterioration. Excessive lap produces an objectionable wide scab of mixture on the surface next to the centerline joint, resulting in an unacceptable appearance.

An intended lap of 25 mm (1 inch) with a variance of 12.5 mm (½ inch) will normally be the optimum overlap for longitudinal joint construction. To maintain these close variances, adjacent lane must be constructed with true edge alignment.

The finishing machine operator shall follow the guideline string exactly. If the machine goes off line for any reason, it shall be adjusted back onto the line immediately. It is incorrect to smooth out the edge alignment by coming back onto the line gradually. This results in long stretches where incorrect lap at longitudinal joint will occur. When batch trucks bump finishing machines off line on curves, movement is usually down the slope of the curve. If the machine is brought back on line gradually, an objectionable, long, straight chord will result in what is supposed to be curved edge alignment.

Irregular edge alignment due to any cause, including adjustments of finishing machine, shall be corrected at once by hand tools. When corrections in edge alignment are



### Sample for Compliance

Sample emulsion at spray bar of distributor with bar valve in a circulating position, prior to dilution.

### Measurement for Pay

Net liters of diluted emulsion.

Keep in mind, diluted emulsion as supplied normally contains 60% asphalt residue, therefore, a 1:1 field diluted emulsion will contain the minimum of 30% residue (*SSHC Subsection 504.03*).

### Settlement of Diluted Emulsions

Varying residue rates of diluted emulsion may be related to blending of original emulsion or settlement while in storage. To minimize this problem, the following steps are recommended:

- Contractor emulsion delivered to storage should be gently circulated prior to pumping into distributor truck.
- If contractor obtains emulsion directly from terminal, the emulsion should be gently circulated prior to use each day.

Material in a storage tank can be circulated with a large diameter, slow turning propeller, or by pumping from top to bottom. Only a small amount of agitation is necessary.

**Forced air should not be used for agitation since it may cause the emulsion to break.**

## 502.40.5 DENSITY CONTROLS FOR ASPHALTIC CONCRETE CONSTRUCTION (*SSHC Subsection 503.06*)

Specifications for asphaltic construction require each layer to be compacted to a density not less than a given percentage of the Rice voidless density.

@ Density of pavement is determined from cores cut by the contractor or by nuclear density gauges, normally on the working day following construction. The method of mix density determinations will be **determined by the contractor, and any disputes will be resolved with cores.**

@ **One** hot box sample per **sublot (750 tons) (680 Mg)** will be obtained from the roadway surface by the contractor and transported to the field lab for testing. The lab will determine the voidless density. **The location of the sample shall be a secret and it must be random.**

An average of the voidless densities for a day's production will be used to determine the degree of field density.

@ Five samples shall be cut from each **3400 Mg (3750 tons)** or use Nuclear Density Gauge to determine density.

The Specifications also describe a procedure for field density evaluation together with a schedule for payment adjustments when noncompliance occurs. Project inspection personnel shall observe the following:

- The contractor is required to take a prescribed number of samples at locations selected and marked out by the project inspector. The project inspector will witness the core sampling. A circle approximately 400 mm (16 inches) in diameter is adequate for identification of sampling location. The core should be taken from within the area identified. It is not appropriate for the contractor to use a nuclear device to "hunt" for a particular spot to sample; coring locations are no longer random when a nuclear device is used in this fashion.
- @ • Sample locations are identified in the random sampling schedule which will be provided by Materials & Research. **Keep the location a secret.** A core will not be taken less than 300 mm (12 inches) from the edge of a given pass of the finishing machine. Procedure for identifying random locations should provide for the potential to obtain a core sample at any distance 300 mm (12 inches) or greater from the edge.
- If the layer being sampled adheres to a lower layer, it may be necessary to sample through two or more layers or full depth. The contractor will need to remove the extra depth by sawing the sample with a masonry saw. It may be necessary to cool the sample by refrigeration or ice to prevent damage during sawing. It is important that core drill bits be kept sharp.
- Each sample shall be inspected carefully by the contractor and inspector prior to testing. Be sure each core sample is representative of the density of the mixture placed and not damaged. If damage is noticeable, discard without testing and take another to replace it.
- If tests indicate that density is less than the specified percentage, the sample shall be retested to insure accuracy. The contractor can request another random sample be taken. (See *SSHC Subsection 1024.02.*)
- Tests on density samples give lower results if samples are damaged during handling. Contractors and project inspectors are advised to use extreme care when taking, transporting, and preparing cores for testing.
- Samples should be transported on hard flat surfaces to avoid loss of density by distortion. If necessary, samples should be stored in a cool place and on a hard flat surface.
- Specifications also require the contractor to take density samples as promptly as practical as prescribed by NDR T 168. Samples should be taken no later than the working day following placement. If the contractor is unable to comply with this timing, the project inspector shall stop construction until the contractor is able to do so.
- NDR personnel shall be responsible for performing density tests as prescribed by NDR T 166 using the contractor provided samples.

- Any failures should be reported to the Project Manager and to the contractor on the day tests are performed.
- When rerolling is performed, insure the area that is rerolled is the complete area of low density, not just the area of the sample.

#### **Procedures for Construction of Test Strips (SSHHC Subsection 503.04)**

@ SSHHC Subsection 503.04 requires the contractor to construct a control (test) strip for all mixture types **except S.P.S.** Test strips are used to evaluate properties of asphalt mixture and identify an effective roller pattern.

Proper construction and documentation of the test strip is the responsibility of the contractor and shall be provided by the contractor to the NDR inspector.

Document the procedure that was followed to construct the test strip.

#### **Resolving Density - Void Conflicts**

@ The project inspector should be aware that the field laboratory and compacted voids are to be tightly controlled. **This may require more compactive effort for compliance.** Become familiar with other controls by reading the *Materials Sampling Guide* and asking questions of Materials & **Research** personnel.

For the case where specified density is met, but field laboratory voids are outside designated limits for two moving average points, the production will cease. The Project Manager may allow production to start following agreement on corrective action to be taken. The contractor will select the combination of rollers to be used and preliminary rolling pattern. Nuclear gauge readings would normally be taken after each pass or series of passes.

The inspector shall only observe and document this process. Documentation of type and amount of compactive effort shall be recorded. Inspector will then select and mark out five random core sites within the test site. Density cores taken by contractor will be tested and results reported as soon as possible.

@ Cooperation between the project inspector, Materials & **Research**, and the contractor is essential to reach a timely solution. If all anticipated results are not met, further experimenting with a different combination of rollers and operation should be performed. Changes in gradation may be one of the first items looked at by Materials & **Research**. Changes in **performance graded binder** content would be one of the last items. Relief from minimum laboratory voids specified may only be approved by Materials & **Research**.

#### 502.40.6 LAYING WIDTHS FOR ASPHALT

Plans for asphalt projects will show the overall dimensions of finished pavement.

When spreading layers of asphalt 38 to 50 mm (1 ½ inches to 2 inches) in thickness, a typical 7.2 m (24 foot) pavement may broaden 50 to 100 mm (2 to 4 inches) in width during rolling. Therefore, laydown width before rolling might require 75 mm (3 inches) less than final design width. An intended lap of 25 mm (1 inch) at the longitudinal joint is best for proper joint construction but seldom seen these days because the contractor has to have someone “set up” the inch overlap. Use of a cutoff shoe when matching a longitudinal joint is not acceptable.

@

When using finishing machines that spread the pavement full width, the inspectors shall insure that contractors adjust the spreading width so the final dimensions conform to the dimensions specified in the project documents.

The finishing machine screed extensions are usually available in 150 mm (6 inches) increments. Where standard screed extensions are utilized to increase the paver width by more than 300 mm (12 inches), the paver auger must also be extended. Many new pavers are equipped with automatic screed extensions which can be adjusted to conform to the required width for most resurfacing situations. Some paver models have automatic auger extensions as well.

#### 502.40.7 PLACEMENT RATES FOR HOT MIX ASPHALT BASES, BINDER, AND SURFACE COURSES

*The inspector shall check contract quantities for accuracy.*

In general, placement rates for hot mix asphalt shall be determined using the contract asphalt mass. The estimated unit mass from design standards used to calculate contract quantities will provide sufficient material for construction of design thickness for most mixtures used.

If the contract quantity is not sufficient to construct the required thickness, notify the Construction Division.

For lower layers on resurfacing projects, automatic controls should not be adjusted repeatedly based on megagram yields taken at short intervals. Automatic controls should be allowed to correct for irregularities in underlying base without frequent adjustments. Accordingly, the placement rate for individual truckloads will sometimes vary substantially from contract rate because of irregularities in old base. However, over longer distances, 500 m (1650 feet) or more, taking both sides of the pavement into account, inspectors should select a general spread rate that compares as closely as possible with contract quantities.

For paved shoulders or other construction where dimensions are controlled by specified elevations, existing structures, or other unusual requirements, spread rates shall be adjusted as necessary.

#### **502.40.8 COLD WEATHER ASPHALT CONSTRUCTION (SSHHC Section 501)**

SSHHC Subsection 501.01 contains limitations for placement of asphalt and liquid bitumen under cold weather conditions. These restrictions apply to pavement surface temperature and time of year, and vary according to whether layer is surface course, lower binder, or base course, and nominal lift thickness.

Cold weather construction problems may show up in the form of increased roughness on profilograph, mat raveling, low density, high voids, segregation, slippage, or failure of tack coat to break. The Project Manager and inspector should be aware of other weather related conditions which may further limit placement.

After September 15, it is appropriate to require tarping and insulation of truck bodies, especially if hauls exceed **3 miles (5 km)** (SSHHC Subsection 503.04). **However, if the contractor can demonstrate that the asphalt temperature is not adversely affected by hauling, the tarp and insulation requirements should be waived.**

@

Base temperature is the single greatest factor in the rate of cool down for freshly placed asphalt mat. Consequently, base temperature has direct affect on recommended minimum laydown temperature and rolling time available to obtain specified density.

Wind velocity, air temperature, and cloud cover are additional factors that affect the cooling rate of hot mix asphalt.

For fall work, a cutback asphalt may be used at the Project Manager's option. Cold surface temperatures cause emulsions to lose tackiness and increase breakage time resulting in higher risk of mat slippage.

#### **502.40.9 RUMBLE STRIPS IN ASPHALT SHOULDERS**

@ *(The paragraph below moved from Page 247)*

Rumble strips will be milled into shoulder on future projects. Department will no longer accept rolled-in rumble strips.

**Table 502.40.1**

<b>NDR Monitoring Program for Asphalt Paving Plants -- Quality Control Methods</b>	
<p>Before production begins, the contractor's plant inspector and the NDR plant monitor should discuss these duties, documentation, sampling and testing plans to ensure compliance with the contract. Any noncompliance or work quality deficiency shall be immediately reported to the contractor's superintendent and the Project Manager. The contractor shall be required to take corrective action. The monitoring requirements are minimum and should be increased if deficiencies occur until the problems are resolved.</p>	
<b>Contractor's Plant Inspection/QC</b>	<b>NDR Minimum Monitoring Requirement</b>
<p><b>Stockpiles</b> Observe construction of stockpiles to prevent segregation, contamination, and intermingling.</p>	<p>Inspect before construction begins and once a week thereafter.</p>
<p><b>Plant Erection</b> Inspect material bin foundations. Assure sampling locations are safe and convenient.</p>	<p>Inspect for evidence of settlement. Inspect prior to calibration and after heavy rain.</p>
<p><b>Plant Equipment</b> Check interlocks on aggregate feeders and performance graded binder delivery systems, screens for removal of oversize material, performance graded binder storage tank, tank stick, and general condition of all plant equipment.  Check scales for sensitivity and accuracy daily.</p>	<p>Inspect all plant and testing equipment prior to calibration (including lab trailer).  Check first day and once a week thereafter.</p>
<p><b>Plant Sampling &amp; Testing</b> The contract allows the contractor to test for gradations by either "cold feed" or "ignition burn-off of field sample." Determine moisture content of all aggregates including RAP. (When daily plant output is less than 750 tons); only one sample is required for every 750 tons of asphalt produced.)  Observe performance graded binder sampling.  Obtain density cores and core thickness.</p>	<p>Witness at least 1 of 4 process samples of each mix type.  Using proper sampling techniques, obtain 1 sample per 7500 tons for Level 1 suppliers and per 3750 tons for Level 2 suppliers and submit sample to Materials and Research Lab.  Identify random core locations, observe core cutting, transport to field lab, determine and record core densities, and core thickness.</p>

<b>NDR Monitoring Program for Asphalt Paving Plants -- Quality Control Methods</b>	
<b>Contractor's Plant Inspection/QC</b>	<b>NDR Minimum Monitoring Requirement</b>
<p><b>Plant Calibration</b> Observe calibration and obtain copy of all calibration data.</p> <p>Obtain copy of job mix formula.</p> <p>Check cold feed bins for method of adjustment.</p> <p>Discuss mix designs and plant controls with Project Manager.</p>	<p>Observe calibration and review calibration data.</p> <p>Participate in check.</p> <p>Participate in discussion.</p>
<p><b>Mix Control</b> Monitor coating of aggregates and mixing time.</p> <p>Monitor and record air, <b>performance graded binder</b>, and mix temperatures on 2-hour intervals.</p> <p>Monitor truck loading procedures, amount of mix maintained in silo, and operation of hopper/silo gates to avoid segregation.</p> <p>Check aggregate proportions, interlocks, and cold feed bin gate settings daily.</p> <p>Inspect trucks for proper/improper use of cleaning fluids.</p> <p>Prepare containers and send to road for hot samples.</p>	<p>Observe each day of production.</p> <p>Check once each day of production.</p> <p>Observe each day.</p> <p>Check first day and weekly thereafter.</p> <p>Monitor daily.</p>
3 of 4	

@

<b>NDR Monitoring Program for Asphalt Paving Plants -- Quality Control Methods</b>	
<b>Contractor's Plant Inspection/QC</b>	<b>NDR Minimum Monitoring Requirement</b>
<p><b>Asphalt Delivery</b>                      Determine quantities on hand and calculate <b>performance graded binder</b> added by tank stick or weighing. Compare with brodie meter daily.</p> <p>Responsible for proper and random sampling of hot asphalt mixture behind paver. Sampling frequency is one sample for each <b>sublot 680 Mg (750 tons)</b> produced.</p>	<p>Monitor once per day.</p> <p>Monitor daily.</p>
4 of 4	



**502.50 ASPHALT PAVEMENT METHOD OF MEASUREMENT AND PAYMENT**

**502.50.1 TESTING FOR SMOOTHNESS (SSHC Section 502)**

@

Equipment for smoothness testing includes the 7.6 m (25 foot) California profilograph and a 3 m (10 foot) straightedge. Pavement surfaces to be tested for smoothness with the 7.6 m (25 foot) profilograph are identified in Plans or Special Provisions. The Contractor is responsible for providing the profilograph. The Department should provide the rolling straight edge. For all projects, the 10-foot straightedge method may be used to identify 1/8" and greater bumps.

Make sure that the tire pressure on the profilograph is maintained at the proper level (210 kPa) (30 psi).

The contractor is not permitted to tight-blade the surface with a grader blade in hopes of minimizing any bumps, and no bonus will be allowed for any section -- regardless of the trace obtained -- if there is any evidence of such scrape marks in that section.

Contractor should be encouraged to test directly behind the finish roller to allow correction of an identified 10 mm (3/8 inch) bump by re-rolling while the mixture is still hot enough to be affected.

Make sure that the profilograph operator maintains a true course while advancing the machine down the road. Weaving, even if not done in an attempt to avoid a rough area, should not be permitted.

Since so much money can be involved, it is very important that you make an effort to have an inspector present while the smoothness testing is being performed. Make it very clear to the contractors that they are to provide adequate notice of any smoothness testing so that inspection can be arranged. DO NOT accept a profilogram if you were not notified about a test and did not have an opportunity to provide inspection.

**Incentive/Disincentive Payments for Asphaltic Concrete Smoothness**

The following standard items and standard item numbers have been established to provide payment for bumps and smoothness incentives/disincentives:

@

9300.70	Deduction for Asphalt Concrete Bumps	Each
9300.60	Smoothness Incentive - Asphaltic Concrete	Mg
9300.62	Smoothness Disincentive - Asphaltic Concrete	Mg
9300.64	Smoothness Incentive – Performance Graded Binder	Mg
9300.66	Smoothness Disincentive – Performance Graded Binder	Mg

The mass of asphaltic concrete to which the incentive/disincentive payment is to be applied shall be determined by calculating the asphalt placed in the top layer within those areas defined by the width of the driving lane (or lanes) shown on the plans and the length (or lengths) of the project subject to profiling, except that:

1. When a narrow shoulder is required to be laid with the adjacent lane (inside shoulder on Interstate, for example), the full lane and shoulder width shall be used.

2. When it is impractical to lay additional width except while laying the top lift through the laydown machine (8.5 m (28 foot) roadway, for example), the full width shall be used.

The thickness of the top layer used to determine the mass shall be either:

1. The nominal thickness shown on the plans (if shown), or
2. The lesser of the actual, average thickness laid or the maximum thickness allowed by the Specifications.

The mass per unit volume used to determine the total mass shall be as follows:

	<u>Mass Per Unit Volume</u>	<u>Mix Type</u>
@	143 lb/ft <sup>3</sup> (2291 kg/m <sup>3</sup> )	SP3, SP4, SP5
@	144 lb/ft <sup>3</sup> (2307 kg/m <sup>3</sup> )	SP0, SP1, SP2
@	145 lb/ft <sup>3</sup> (2323 kg/m <sup>3</sup> )	SPL
@	146 lb/ft <sup>3</sup> (2339 kg/m <sup>3</sup> )	SPS

The mass of asphalt cement to which the incentive/disincentive payment is to be applied shall be determined by the formula:

$$\text{[Concrete mix (mass)] (Percent of Performance Graded Binder)} = \text{Mass Performance Graded Binder}$$

Unless revised by the Materials and Research Division, the percentage of performance graded binder to be added as shown on the EBM shall be used to compute the smoothness incentive/disincentive for performance graded binder.

When calculating the pay factor for smoothness (PF), round to the nearest hundredth.

The unit price for the incentives shall be calculated by the formula:

$$\frac{(\text{Pay Factor} - 100.00)}{100} \times \text{Contract Unit Price}$$

and entered as a "positive" dollar amount.

The unit price for the disincentives shall be calculated by the formula:

$$\frac{(100.00 - \text{Pay Factor})}{100} \times \text{Contract Unit Price}$$

and entered as a "negative" dollar amount.

be corrected by hand tools. When the straightedge indicates no high or low spots, compaction should be permitted with the initial roller.

3. The third check with the straightedge is across the joint between cold pavement and hot mixture after compacted with initial roller. This third check indicates whether the correct amount of material has been placed. For instance, if freshly rolled layer is too high, it indicates too much material has been placed. If freshly rolled layer is too low, it indicates not enough hot mixture has been placed.

For that reason, high or low transverse joints are not usually corrected by additional rolling. Instead, corrections should be made by cutting or filling the rolled surface while the mixture is still warm and can be manipulated. If there are unusually high or low areas after rolling, paths must be shoveled through the pavement for finishing machine tracks. Finishing machine is then backed up to the joint and paving operation is started again.

The above procedure shall be repeated as necessary until the straightedge indicates that a good riding joint has been constructed. If repeated repaving operations cause the mixture to cool to the extent that reuse becomes impractical, it should be removed and wasted.

4. The final procedure for insuring proper construction at transverse joints is checking for true edge alignment. Edge of the freshly rolled layer should be carefully trimmed by hand tools until it matches the alignment of adjoining cold pavement.

### 502.50.3 PERFORMANCE GRADED BINDER

@ When payment for an asphaltic concrete mixture is based on megagrams, payment will also be made for **performance graded binder** as a separate item. Compensation will be made for all megagrams of asphalt binder incorporated into the construction within Specification tolerances. (*SSHC Subsection 503.05*)

Megagrams of **performance graded** binder paid is not deducted from megagrams of asphaltic concrete mixture measured for payment.

@ When small quantities of asphalt binder are involved, the design plan may state that **performance graded binder** is considered subsidiary to asphaltic concrete. Check the special provisions for this reference.

For specific mixes used as patching materials, or in an alternate bid situation, payment may not be made for **performance graded** binder.

#### **Tank Measurement and Performance Graded Binder Content Determination**

@ At batch plants, automatic or semi-automatic printouts record the actual mass of **performance graded binder** in each separate batch. This quantity may be used for payment.

Volume measurements will be converted to mass by computation. The amount in storage at beginning of project will be measured or estimated by inspector and added to

amount measured for payment. Asphalt binder remaining in storage at end of project and amount otherwise not used in the work will be measured or estimated by inspector and deducted from amount measured for payment.

### **Measuring Asphalt Binder for Small Quantities**

*SSHC Section 109* provides that by mutual agreement, the method of measuring asphalt binder for payment may be modified when small quantities or intermittent operations are involved.

If a recorded mass is not available, quantity may be calculated from intended asphalt binder percent with asphalt plant meter results providing further verification. For small quantities on a given day, the previous day's tank stick may be used as a check.

The project inspector should document procedure selected and reasons for doing so.

### **Asphalt Binder Quantities and Pay Adjustments**

Asphalt binder contract quantities for a project are estimated based on a basic asphalt binder content identified in the contractor's mix design.

When noncomplying viscosity or penetration tests occur, payment for asphalt binder incorporated into affected asphalt mixture is subject to price adjustment as prescribed in the *SSHC Subsection 503.06*.

### **PG Binder/RAP – Pay Adjustments**

@ The contractor's initiative to substitute RAP and correspondingly reduce the amount of performance graded binder should not be reason to negotiate a higher price for the binder because it is a major item of work. The Specifications will be modified to add this safeguard.

Binders from different suppliers should not be mixed.

## **502.50.4 TARGET VALUES FOR ASPHALTIC CONCRETE PRODUCED**

The tolerances specified for asphaltic concrete are provided for reasonable variances only. Whenever regular and repeated variances from target values occur, the Project Manager shall insist on quick and corrective action by contractor to secure target values, not simply within tolerance.

The above comments are addressed to asphalt binder content, aggregate tolerance and specifically to air voids and VMA values.

## **502.50.5 MEASURING ASPHALT MATERIALS**

*SSHC Subsection 503.03* covers equipment and procedures for measuring the mass of the asphalt materials. When automatic or semi-automatic measurement is used, continuous direct observation of the measuring process by a scale inspector is not required. For manual measuring of loaded trucks, Project Manager may assign a scale inspector. This normally occurs only when accuracy in the measuring procedures is in question.

When witnessing is required, scale inspector should be positioned near contractor's scale operator so measuring can be closely observed. Contractor's representative shall write the scale tickets and present them individually to scale inspectors for their signatures or initials before each truck leaves the plant.



**506.00      MILLINGS**

Millings that are to be used as a base or foundation course shall pass a 38 mm (1 ½ inch) screen opening.

Each District remains responsible for specifying the disposition of millings.

@ Specifications and special provisions need to be crystal-clear as to exactly which millings are available and at what cost.

Pre-letting information should only be released through Frank Brill's office (479-4568) so that no relevant bidding information is withheld from any possible bidder.

@

10. Watch concrete placement for compliance with specifications.
11. Check machine installation of steel.
12. **Should not use water as a finishing aid; approved chemical finishing aid/evaporation retardants are also authorized.**
13. Check surface with straightedge. Remove depressions and irregularities.
14. Check tining for conformance to specification.
15. Stamp station numbers in the plastic concrete.
16. Check application of spray curing compound.
17. Inspect prepared joints prior to sealing.
18. Inspect sealed joints.
19. Observe contractor's performance of pavement smoothness testing.
20. Notify coring crew of placement.
21. Each day prepare DR Form 85, Pavement Laid Report.
22. Reset section corner markers. (See Subsection 104.03)

Construction Critical Area:

1. Maintain a uniform roll, of about 100 mm, of concrete ahead of the front screed and a minimum of a 50 mm roll ahead of the rear screed.
2. Placement of tie bars and key ways.
3. Verify string line is tight and in correct position.
4. Verify layout will place longitudinal joints at correct locations. (Usually should coincide with lane lines.)
5. Use 3 m (10 foot) straightedge behind paver to check smoothness.
6. The time the concrete is in the truck and the time it sits on the grade should not exceed the specifications limits.
7. Trucks that segregate concrete or have cement balls must not be used.
8. The timing of cure application and even coverage.
9. Timing of joint sawing.

Safety Areas:

NDR Tests:

1. NDR T 23 Making and Curing concrete test specimens.
2. NDR T 119 Slump of Portland Cement Concrete.
3. NDR T 141 Sampling of Fresh Concrete.
4. NDR T 152 Air Content of Freshly Mixed Concrete by the Pressure Method.

**601.02 CONCRETE PLANT CHECKLIST**

*SSHC References:*

*Section 603 Concrete Pavement*  
*Section 1002 Portland Cement Concrete*  
*Section 1004 Portland Cement*  
*Section 1005 Water for Concrete*  
*Section 1006 Calcium Chloride*  
*Section 1007 Concrete Admixtures*  
*Section 1008 Fly Ash*  
*Section 1009 Silica Fume*  
*Section 1033 Aggregates*

Inspection Crew:

Certified Plant Inspector

Inspection Equipment:

Large balance or Dunagan buoyancy apparatus (5 kg)  
Small balance (2 kg)  
Set of gram weights, 2 kilogram weights  
Set of coarse aggregate sieves and a set of fine aggregate sieves  
Mechanical shaker  
2 burner gas or electric stove  
Sampling bags and containers  
Slump Cone  
Air Meter (pressure)  
Cylinder Molds and Lids  
Rod  
Mallet  
Strike Off Bar  
Ruler  
Water Bottle

Plant Procedures:

1. Check Plant Certification Checklist before production begins. This may be accompanied with a check of the equipment.
2. Check cement, fly ash, and admixture certifications and if approved; before production begins and when new materials arrive.
3. Check aggregate piles for segregation and contamination. (*SSHC Subsection 1033.03*)
4. Take materials samples as required by the Sampling Guide and specifications.
5. Test materials as required by the Sampling Guide and specifications.
6. Each day check the batching operation as needed.
7. Collect Proportioning Reports daily.
8. Check truck ticket for correct volume as necessary.
9. Send copies of Proportioning Report to Concrete Materials Section of the Materials and **Research** Division daily. Keep truck tickets in project file.

@



- @ Construction Critical Areas:
1. Cementitious material bins must be **watertight** and prevent contamination.
  2. Coarse aggregate stockpiles must be watered.
  3. Admixtures need to be protected from freezing.
  4. Delivery trucks need to be checked for wash water before batching each load of concrete.

Safety Areas:

- NDR Tests:
1. NDR T 23 Making and Curing concrete test specimens.
  2. NDR T 119 Slump of Portland Cement Concrete.
  3. NDR T 141 Sampling of Fresh Concrete.
  4. NDR T 152 Air Content of Freshly Mixed Concrete by the Pressure Method.
  5. NDR T 27 sieve Analysis of Fine and Coarse Aggregates
  6. NDR T 248 Reducing Field Samples of Aggregate to Testing Size
  7. NDR T 506 Determination of the Free Moisture Content of Aggregates
  8. NDR T 504 Determination of Clay Lumps, Shale, and Soft Particles in Coarse Aggregate and of Clay Lumps in Fine Aggregate and Sand and Gravel Aggregates
  9. NDR T 255 Total Moisture Content of Aggregates by Drying

## **602.20 PCC PAVEMENT MATERIAL REQUIREMENTS**

### **602.201 Composition of Concrete** (*SSHC Section 1002*)

@ The plans or special provisions may offer the contractor a choice of various classes of concrete. *SSHC Section 1002* lists the classes of concrete used in Nebraska road construction. If a choice is allowed, the contractor is required to advise the Project Manager of the class of concrete to be used. This notification must be given prior to construction. The Materials and Research Division should be consulted in regard to problems of concrete composition. Table 1002.02 shows authorized mix proportions for the classes of concrete.

Material Inspection - The production of a high quality concrete requires careful control over concrete materials at the batch plant. The inspector must be prompt and accurate to insure quality concrete.

@ *SSHC Sections 601, 602, and 603* contains requirements for concrete pavement construction. The Project Manager and inspectors must familiarize themselves with these requirements and insist that materials be tested and approved before being incorporated in the work. The frequency of sampling, testing or submitting of material samples to the Central Laboratory and the procedures to be followed are covered by the **Materials & Research Materials Sampling Guide**.

Field Testing Laboratory - *SSHC Subsection 105.03* requires the contractor to furnish a field laboratory building meeting certain specific requirements for the type required in the contract. The project manager should document compliance for the laboratory's condition in the Field Book and notify contractor of any problems.

Admixtures - *SSHC Section 1002* states that "only admixtures authorized by the contract documents will be permitted for use in portland cement concrete". Since the various materials constituting admixtures can have a profound effect on the characteristics of the hardened concrete, extreme caution is justified. (See *SSHC Section 1007* for more information on admixtures.)

### **602.202 Concrete Strength**

Currently, four test cylinders are to be fabricated for each placement (generally four cylinders are required for each lot of concrete). These test cylinders are then tested at ages of 7, 10, 14, and 28 days.

@ If the 7-day cylinder tests 25 MPa (3500 psi) or above, the 10 and 14-day cylinders need not be tested and can be discarded. If the 7-day cylinder should test less than 25 Mpa (3500 psi), the 10 and 14-day cylinders must be retained and the above policy applied to the 10-day cylinder. In any case, the 28-day cylinder must be retained and tested.

### **602.203 Concrete Sampling Locations**

Concrete samples shall be collected from at least three different portions of a batch after it is discharged, whether mixed on site or central mixed. Sample location point shall be after plastic concrete has been placed on the grade, either by direct depositing from a batch truck or by use of a placer/spreader machine. On slipform paving projects, optimum sample location is between placer/spreader and slipform paver machines. Care should be taken to

**602.208 Miscellaneous Material Requirements**

Concrete with a low air content shall not be incorporated into work. **Only one addition of air entraining admixture is allowed at the site.** (See *SSHC Subsection 1007.03*)

Concrete with a high air content should not be incorporated into work except under extreme circumstances. If low compressive strengths result, the concrete may be required to be removed and replaced.

@ The *Materials Sampling Guide* requires that the pink copy of the DR Form 22, Certificate of Compliance, or a copy of the mills own certification form be mailed to the Materials & **Research** Division. These are required in order for us to determine the quantity of cement which was used when additional estimates are processed.

The certificate of compliance is needed both for mills that require sampling and those that do not. When a sample is required, normal procedure has been to submit the pink copy with the sample. This is acceptable. For those mills which do not require sampling, please collect and submit the certifications on a routine basis but at a minimum of once each week.

Make at least two trials for each setting of the dial to insure consistency in the measuring device. Record the calibration in the inspector's notebook. Check the valves to see that no water dribbles into the mixer drum when the tank is shut off.

Admixture Dispensers - When an admixture is to be added to the mix it should be arranged to enter the drum with the mixing water. The volume graduations on the AEA dispenser should be checked by measuring the amount released at each setting and the results recorded. The amount dispensed should be accurate within 3 percent of the quantity specified for each batch.

Mixer Performance Tests - A decrease in mixing time can be made under certain conditions, including the use of interlocked automatic batching. The basis for permissible reduction of mixing time is the contractor's mixer performance test.

@ Specific sampling and testing procedures, equipment list and method of reporting are included under the **Materials & Research** *Materials Sampling Guide*.

**602.306 Hauling Equipment (SSHC Subsection 603.03)**

May be one of two different types, depending on the setup at the plant:

1. Trucks which have drums or containers (dump trucks) in which central mixed concrete is delivered to the project. (30 minute limit till discharged.)
2. Trucks which have a concrete mixer mounted on the truck bed to provide complete mixing of concrete ingredients after they have been batched or blended at the central mixing plant. (90-minute limit till discharged.)

@

Trucks and Mixers - Each vehicle shall have a metal plate attached and listing:

1. Designed use.
2. Concrete capacity
3. Rotation (RPMs) of the mixing drum or blades.

Mixers and agitators shall be operated within the limits of capacity and speed of rotation designed by the manufacturer of the equipment. When used as a mixer, it is important for the inspector to make sure that the equipment is not loaded beyond its capacity. Blade wear should be checked against the manufacturer's design. Blade height should be at least 90 percent of original height. There should be no appreciable accumulation of hardened concrete. Control and measurement of water added should be clearly inspected. Revolution counters should be checked.

@

**602.307 Subgrade Trimmer (SSHC Subsection 302.03)**

Check the setting of the cutting blades to secure the exact subgrade crown and elevation. The subgrade trimmer, if used, should operate at least 90 m to 150 m (300 to 500 feet) ahead of the concrete placement operation. **Usually, the segment that is to be paved will be trimmed at least one day prior to concrete being placed on the job.**

@

**602.308 Concrete Spreader (SSHC Subsection 601.02)**

The spreader or mechanical strike-off must be self-propelled and equipped with:

1. A power-driven spreading device.
2. An adjustable strike-off blade capable of striking off the concrete at any required elevation within the forms. This requirement anticipates the construction of reinforced concrete pavement in two courses. The strike-off should be adjusted so that some concrete will be carried in front of the blade.
3. Vibrators, either internal or surface type, capable of consolidating the pavement to its full width and depth. These should be checked for frequency of vibration with a contractor supplied tachometer.

**602.309 Finishing Equipment**

*SSHC Subsection 601.02* provides for use of various types of concrete pavement finishing machines. Mainline paving is intended to be placed with a finishing machine designed for concrete paving. Approval may be given for alternate types of finishing equipment based on satisfactory field performance. Should a new machine be brought on the job and contractor's staff are not experienced with its operation, a qualified manufacturer's representative should be present until equipment is in proper adjustment and functioning as intended.

Equipment normally associated and approved for hand methods shall not be substituted for a finishing machine on mainline paving. Bridge deck finishing machines are not approved for placement of standard paving when a finishing machine is required, due to their lack of adequate consolidation equipment.

The finishing machine must be self-propelled and equipped with:

1. Two independently operating screeds constructed with end wings to prevent concrete spillage over the forms.
2. A pan-type finisher-float for each paving train.

If the screeds are the conventional reciprocating type which ride on the forms, check the end shoes for a worn surface. A poor slab surface with a valley along the form will result from worn end shoes.

A crown check of the screeds and pan-type finisher-float should be made by the contractor and in the presence of the inspector or project manager before the start of paving operation. To check the crown, raise the screed or float and stretch a 20-gauge piano wire or strong fish line across the bottom about 25 mm (1 inch) from the front face. Place a similar wire about 25 mm (1 inch) from the back face. Lower the screed or float down to the forms or to

**602.40 PCC PAVEMENT PRECONCRETING CONFERENCE (SSHC  
Subsection 1002.03)**

On all projects involving PCC pavement, the Project Manager and inspectors should meet with appropriate contractor and supplier personnel to discuss concrete production and pavement placement quality issues before any materials are placed. When ready mix concrete is used, the ready mix producer should also attend.

For the various types of work, the following items should be covered:

- Approvals and required quantities of aggregate and cement, class of mix, time and rate of delivery, percent of air, slump, batch weights, volume per truck, total quantity required, preparation of delivery tickets, testing arrangements, procedures in case of load rejection (air can be increased), responsibility for setting batch weights and amount of admixtures, placing, finishing and curing arrangements, and personnel work assignments.
- Adverse (cold or hot) weather plan of action.
- Settings and condition of paving equipment, dust control, subgrade treatment, procedure for checking steel placement, utility and street return box outs, heading-up equipment, joint sawing and cleaning, joint sealing, rain damage prevention, and cold weather protection.

Only one preconcreting conference is considered necessary for thoroughly discussing the work and responsibilities and duties of all involved in the project. On small projects it may be possible to include a preconcreting conference with preconstruction conference.

**602.401 PCC Daily Report of Pavement Laid (DR Form 85)**

The daily inspection report on paving work is a record of the construction progress, working conditions, weather, etc. during paving and plant operations which may affect pavement quality. This report keeps the central offices advised on job status and serves as a detailed permanent record of the paving project. At the end of each day on which any pavement was placed, this report is to be completed by field inspection staff for appropriate distribution.

@ **The Daily Pavement Laid Report must accurately reflect the type of cement used.**

alert the contractor when chosen methods may produce unsatisfactory results. All aggregates are to be stockpiled separately. (*SSHC Section 1033*)

If a bulkhead is used in separating the individual aggregates it should be high enough to prevent intermingling of the aggregates. Aggregates which become intermixed shall not be used. Building a stockpile properly in horizontal layers tends to reduce the tendency to segregate. If the material is being dropped from a considerable height, the stacker should be equipped with a rock ladder or tremie to reduce the falling impact and prevent segregation. A brisk wind blowing through the falling aggregates will deposit the fines on the lee side of the pile while the larger particles remain on the opposite side. It is the contractor's responsibility to provide the specified gradation of the aggregate entering the mix. When crawler tractors are used on gravel stockpiles, the contractor must clean all caked dirt and mud from the track ways and from beneath the machine before running it on the pile. Crawler equipped dozers or end loaders must not be allowed to damage aggregates in the stockpiling areas.

If the aggregates are hauled to the project in railroad cars, burlap and boards used to chink cracks in these cars become mixed with the material. A grizzly with a maximum of 150 mm (6 inches) square openings should be placed on top of the aggregate bins to catch foreign material previously missed. They should be cleaned at least twice daily to prevent forcing the foreign material through the grizzly openings and into the batch.

#### **602.509      Batching Inspections**

General - The importance of proper batching inspection cannot be over-emphasized since proper proportioning of materials is one of the major steps in obtaining a satisfactory pavement. The plant inspector and his/her assistant carry out the inspection at the batching plant. The following items should be closely inspected during the progress of the work:

1. Be familiar with the physical characteristics of aggregates, design mix proportions, the method of determining batch quantities, scales operation, yield, effective water, cement factor and the procedure for adjusting proportions and yield when using air entrainment.
2. Calibration of scales and measuring devices, and the systematic and regular checking of scale settings for batches to assure proper quantities are being dispensed. (Scale settings are not to be made by the inspector since this is the contractor's responsibility.) The NRMCA, Quality Control Manual, Section 3, Plant Certification, outlines the steps required of the contractor in calibrating the scales and checking their sensitivities.
3. Sampling and testing is as indicated by the **Materials & Research** *Materials Sampling Guide*.
4. Water of doubtful quality must be tested and accepted prior to incorporating in the mix. The intake end of the pipe or hose used in pumping mixing water from a stream or standing body of water should be covered with wire mesh and located so that no foreign matter will enter. Hauling of mixing water should be done in clean, covered containers. Assurance of using acceptable water is the responsibility of the plant inspector for central or ready mixing and the responsibility of the slab inspector for on-the-job mixing.

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discontinued when a crack develops ahead of the saw. If a joint is sawed where a crack exists or develops during sawing, the sawed joint or portion considered to not be the working joint shall be cleaned and epoxied.

In the multilane pavement, for the companion lanes, those joints that are open and working should be sawed as control joints. Volume change stresses from the initial lane are transmitted through the tie bars and edge friction to the second lane. A matching plane of weakness must be sawed in the second lane to prevent formation of an uncontrolled crack.

Uncontrolled cracks in the initial lane must be matched with a control joint in the companion lane. In laying out joints, blocks of concrete should always be 3 m (10 feet) or more in length.

Instances have been noted where the depth of the sawed joint through the curb section was insufficient on concrete pavement construction requiring integral curb. The depth through the curb section is variable and is to be sawed as shown on the plans. This should be brought to the attention of the contractor and your assigned inspector.

Longitudinal Joints - The time for sawing the longitudinal center joint is not critical. The concrete shall have hardened sufficiently to permit the sawing of a sharp-edged, clean cut joint.

### **Sealing Joints**

@ As concrete cures, moisture moves to the surface. Therefore, concrete should be cured seven days or more before sealants are applied. **Insure that sealant manufacturer's procedures are followed. Check for moisture in the joint before the sealant is applied.**

### **Hot Poured Sealants**

All joints required to be sealed shall be filled immediately after they have been cleaned and dried, and checked for proper depth. A hot poured joint sealer must be applied with the use of a pressure-type applicator equipped with a nozzle which will fit into the sawed groove. How full the joint is to be filled should be discussed with the District Construction Engineer. However, placement of joint sealer should be done in a neat, workmanlike manner striving to eliminate any smearing of sealer on the pavement.

The Project Manager should obtain the manufacturers recommendations for temperature control of the joint sealer, and frequent measurements of the actual temperatures should be made to insure compliance with those recommendations.

If curing compound is applied on a slab with open joints the contractor should lay a rope or belt along the length of the joint to exclude the cure from the opening. If curing compound has been permitted to enter a joint, the contractor should be required to resaw the joint.

All joints to be sealed shall be cleaned with a jet of compressed air, flushed out with water under high pressure and diked before pouring the joint sealing filler.

We have experienced some problems in the past regarding hot pour joint sealer and white pigmented curing compound. The problem stems from the fact that the manufacturer is supplying his/her distributor, or the contractor, with a certificate of compliance stating that the material meets Nebraska Department of Roads' specifications as well as the applicable



ASTM and AASHTO specifications. In one instance, the certification also stated the material to be pretested. However, this has since been corrected by the manufacturer.

@ We want to emphasize that if hot pour joint sealer is from tested and approved stock, this material can then be used upon delivery to the project. The lot number will appear on the NDR Approved Products List for approved stock. The Materials and **Research** Division should be notified as to the lot numbers and quantity delivered. If the lot number is not on the NDR Approved Products List, then the joint sealer must be tested and approved before it is used. We do not accept joint sealer by certificate of compliance or by a Project Manager's certification, unless this is the rubber modified asphalt compound consisting of an asphalt cement containing a minimum of 22 percent of new or reclaimed, synthetic or natural rubber. This material is accepted by a certificate of compliance furnished by the supplier per the Special Provisions.

The foregoing instructions concerning tested and approved stock also applies to cold poured joint sealer, preformed joint filler, and pressure relief joint filler.

#### **White Pigmented Curing Compound**

@ White pigmented curing compound that **is** approved for use **is** shown on the Approved Products List. The Materials and **Research** Division should be advised as to the quantity and lot numbers involved. Reports will then be issued to the project. Curing compound not from tested stock must be sampled and tested prior to being used. We do not accept curing compounds by certificate of compliance or Project Manager's certification.

#### **Preformed Polychloroprene Elastomeric Type (SSHC Section 1016)**

The construction procedures in *SSHC Subsection 603.03, Paragraph 7* are quite detailed and close adherence to these instructions is important to insure the proper performance of the seals. Important points to emphasize in this type of construction follow:

1. Installation should result in less than 5 percent elongation of the performed seal.
- @ 2. Sawed joint dimensions should be of correct size - neither too large **nor** too small.
3. Sawed joints should be inspected closely for cleanliness at the time of installation.
4. Spalls should be repaired as indicated in the specifications.
5. Certification as indicated in Specification Subsection 1016 should be in the Project Manager's files before installation.
6. Excessive adhesive has been known to accumulate on the top of the seal, preventing proper expansion of the seal.
7. Hot dry weather can produce a condition of premature set to the adhesive and this can be the cause of seal popping.
8. The seals be placed at the specified depth. If placed too high, attrition will take its toll.

**602.60 PCC PAVEMENT METHOD OF MEASUREMENT**

**602.601 Smoothness Tests (Profilograph)**

1. See *SSHC Section 602* for profilograph procedures.
2. When the contract Special Provisions require the smoothness of the concrete pavement to be tested by measurement with the profilograph, it is necessary and a requirement of the Provision that the thickness cores be taken after to any surface correction (grinding) by the contractor.
3. Since the thickness cores are taken by personnel from the Materials and **Research** Division (Lincoln), it is necessary they be kept posted as far in advance as possible when the coring must be done. It is generally preferable to do the coring prior to opening the pavement (segments in some cases) to traffic. Accordingly, prior planning is necessary and shall be accomplished by the Project Manager. Contact Rhonda DeButts at 479-4760 or Dave Hall at 479-4837 in the **Materials & Research** Quality Assurance Section.

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**602.602 Requirements for Thickness**

*SSHC Subsection 603.05* indicates the thickness requirements and includes a table of payments to be made for concrete of less than plan thickness. The table is based on the premise that a pay deduction should be proportioned to the reductions in service resulting from thin pavement. Thus the reductions in payment are quite severe.

**602.603 Material Quantities**

Concrete pavement is measured for payment in square meters in place and accepted, minus deductions. The reinforcing steel and dowel bars required by the Plans and Special Provisions will be considered subsidiary to the other pay items in concrete pavement construction.

*SSHC Subsection 603.04* states that the quantity of concrete pavement will be measured by the square meter. This is interpreted by the Construction Division to mean that when the plans, stakes, etc., order a nominal width of pavement and the Project Manager determines that this nominal width requirement is met or exceeded, the nominal width will be used to compute the quantity for the concrete pavement item, i.e., the contractor should not be permitted to increase his/her compensation by purposely or inadvertently constructing the pavement to a width greater than the nominal width.

Base course, foundation course, and subgrade preparation are not measured quantities. They are established quantities that are based on the paved area.

**602.604 Concrete Driveways**

*SSHC Subsection 609.04* states that concrete driveways will be measured by the square meter. This is interpreted by the Construction Division to mean that when the Project Survey Crew stakes the driveway for certain dimensions these are the dimensions that will be used to compute the area for payments.

## 602.605 Records and Reports

Daily Report of Concrete Pavement Laid (DR Form 85) should be prepared daily. The cylinder data for the day covered by the report should be written at the bottom of the form. Reports should be delivered to the plant inspector as early as possible so he/she may complete his/her records for the day reported.

When reporting multilane pavement, or when paving one lane on 2-lane pavement always report the lane being paved. Identification of the lane on multilane pavement should be positive - such as: 12' lane, 12'-24' Rt. of centerline. Lack of this information may result in confusion and delay in preparing the pattern of cores for the core drill. Sketches of irregular areas should be shown on the reverse side of the slab report DR Form 85, or prints of intersections and other unusual layouts may be ordered from the Lincoln Office for the purpose of logging daily pour information and should be turned in with the slab report which substantially completes the area involved. Sketches need not be elaborate but should clearly identify the area placed with any necessary dimensions. A diary record is also required.

Section corners falling within the area of the concrete pavement may be perpetuated by a registered land surveyor who will take a core as described in *CM Section 1300.03*, "Perpetuating Section Corner Markers". In many instances it may be possible to set the section corner while the concrete is plastic and cores need not be taken. If cores are needed to set the section corners, a list of the corners to be so perpetuated should be submitted to the Materials and Research Division as early as possible prior to the time that the pavement is to be cored. This list should include the station location and distance right or left of centerline of each section corner to be cored.

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**603.00 PCC PAVEMENT PATCHING**

**603.10 Full Depth PCC Patches**

The plans show the details for full depth patches for PCC pavement or resurfaced PCC pavement. Each of these details identify the required depth of concrete for the patch. There are six pages of details that describe pavement repairs that will not receive an overlay and four pages of details that describe pavement repairs that will receive an overlay. However, only those details that are applicable are included in any set of plans. In general, if the length of the repair is 4' to 9', then it is considered "Joint Repair." If the repair is over 9', then it is called "Pavement (Panel) Repair."

The transverse and longitudinal faces of the pavement around the repair receive different treatments. The surface in the transverse (width of pavement) direction will either receive dowel bars or have the surface beveled to wedge the patch so it will not settle below the existing roadway surface. The longitudinal surface will be vertical and may have tie bars (see plans for details).

The details also show how to remove the pavement. The detail for beveling the transverse ledge includes both a full depth saw cut and a 2-inch + ¼ inch deep saw cut. The full depth saw cut is usually performed with a wheel saw. These saw cuts are intended to sever the pavement totally so the existing pavement can be completely removed. The breakout area between the full depth cut and the 2-inch depth cut should create a beveled ledge that will wedge the patch in place and prevent it from slipping below the roadway surface.

**603.20 SAW CUTS IN FULL DEPTH PCC PATCHES**

Some contractors have delayed saw cuts for joints in full depth PCC patches until after minimum 5-hour cure period (on two-lane roadways). Due to rapid setting concrete used for these patches, random cracks often appear when joints are not sawn quick enough. Any joints in full-depth patches shall be sawn as soon as possible as long as raveling of saw cut edges does not happen. This early sawing will require temporary removal and replacement of required insulation boards in cold weather.

Any random cracks that appear due to a delay of the saw cut operation shall be repaired by the contractor. Repair will consist of routing random cracks with a crack saw and sealing with hot pour sealant. These repairs will be at the expense of the contractor.

**Low Strength Deductions**

@ Materials and Research will make deductions for concrete pavement because they establish the strength --- from cores which they have taken --- used to determine the basis of payment.

Payment for PR concrete, unlike pavement, is based upon cylinder strengths rather than from core strengths. Accordingly, the Project Manager should make the deduction when PR concrete for patching does not make the required strength. The deduction should be based on the 24-hour break strength of a cylinder using the deduction factors shown in Table 603.02.

Materials and Research will not make a deduction for PR concrete even if you submit a cylinder strength report indicating the low strength.

@

Treated Timber

Notify Materials & Research if timber piling appears damaged. The Project Manager or inspector must obtain approval to reject timber piling.

Piling certification procedures are found in the *Materials Sampling Guide*.

Pile Driving Procedures

The contractor should build a frame (sometimes called a checkerboard) to hold each pile in the exact position for driving.

Before driving any piles, the inspector should perform the following duties:

1. Verify that piles will be driven exactly as shown in the plan pile layout.
2. Check pile spacing, and record heat numbers (steel pile), code identification (concrete pile) and other pertinent information. Document points and splices.
3. Verify cut-off elevations against a permanent reference.

Confirm that the Project Manager, inspector and contractor understand:

1. How to check penetration depth at any point.
2. How to take and record bearing tests data with saximeter.
3. How to determine the cut-off elevation for individual piles.

*SSHC Subsection 703.03*, Paragraph 2. allows bearing piling to be driven with a gravity hammer for the first half of the penetration when bearing does not exceed one-third of the design bearing (see Table 703.02).

Concrete sheet piling shall be driven with a preapproved hammer.

Do not allow pilot holes or preliminary jetting to be greater than 3 m (10 ft).

- b. Additional piling may be added to the group.
- c. Extend the piling and drive to obtain design bearing.
- d. Determine a soil set up factor and then drive to cut-off elevation.
- e. Use pile-driving analyzer to determine bearing.
- f. Run a load test to check if bearing capacity is obtained.

Notify the Construction Division when two or three consecutive piling do not attain design bearing.

@

- 8. a. Record pile data on the M&R spreadsheet.
- b. E-mail a copy of the spreadsheet to M&R (O. Qudus) and to Construction Division (B. Caples).
- c. Do not use contractor provided charts for determining bearing.

Soil Setup Factor

- 1. Two representative piles shall be driven to 600 mm (2 ft) above cut-off elevation (see SSHC 703.07 para 4.f.).
- 2. The piling at cut-off+600 mm (2 ft), will be rested for 36 hours and then driven to cut-off elevation with a "warm" hammer.
- 3. The Project Manager will record the penetration for each ten blows of the hammer until cut-off is reached.
- 4. Record data and call it in to the Construction Division.
- 5. The factor and a decision on what action to take will be sent back to the Project Manager.
- 6. Construction Division recommendations shall be recorded under the Remarks Section of the pile driving record.

Bearing Capacity Procedure

- 1. Determine bearing at or just prior to the pile reaching final penetration.
- 2. When determining bearing, the inspector shall be certain that all of the following conditions exist:
  - a. For single action, the hammer shall have a free fall.

- b. The contractor elects to stop driving after reaching bearing and minimum penetration but before the order length is driven.

6. MASS FOR PRESTRESSED CONCRETE BEARING PILE

@

For computing bearing capacity required on **M&R Pile Bearing spreadsheet.**

Pile Type	Constant Section Mass Per Meter of Pile (Kilogram) (lb)	
I	220	(485)
II	298	(657)
IV	315	(694)

**(See Appendix 1. DR97-Pile Driving Record)**

Critical Construction Areas

- 1. Proper placement and length.
- 2. Permanent reference point.
- 3. Removal of broken/collapsed piles.
- 4. Achieving design bearing capacity.

NDR Tests

- 1. Test pile.
- 2. Bearing capacity.
- 3. Pile Driving Analyzer.

@

Inspector's Records and Forms

- 1. Pile Record **M&R spreadsheet**
- 2. Hammer Data Sheet

**701.02 CONCRETE CONSTRUCTION CHECKLIST**

SSHC References:

- Section 704 Concrete Construction*
- Section 1002 Portland Cement Concrete*
- Section 1010 White Opaque Polyethylene Film and **Burlap**--Polyethylene Sheeting For Curing Concrete*
- Section 1011 Burlap For Curing Concrete*
- Section 1014 Joint Sealing Filler*
- Section 1015 Preformed Joint Filler*
- Section 1016 Preformed Polychloroprene Elastomeric Joint Seals*
- Section 1033 Aggregates*

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Inspection Crew:

Lead Inspector

Inspection Equipment:

Slump Cone  
Air Meter (pressure)  
Cylinder Molds and Lids  
Rod  
Mallet  
Strike Off Bar  
Ruler

Placement Procedures:

1. Preplacement check of equipment.
2. Check condition and placement of steel.
3. Check Form setting and alignment. Verify location coordinates and orientation.
4. Have contractor wet grade and forms before concrete placement.
5. Test concrete for air content, slump, and make cylinders when mix changes, as a minimum according to Sampling Guide.
6. Watch concrete placement for compliance with specifications. Do not allow free fall greater than 1.5 m (5 ft).
7. Do not use water as a finishing aid; use an approved chemical finishing aid/evaporation retardant.
8. Check curing operation.

Construction Critical Area:

1. Take pictures of any pavement under bridge before work begins.
2. Achievement of concrete consolidation without segregation.
3. The time between loads of concrete.
4. Trucks that segregate concrete or have cement balls must not be used.

NDR Tests:

1. NDR T 23 Making and Curing concrete test specimens.
2. NDR T 119 Slump of Portland Cement Concrete.
3. NDR T 141 Sampling of Fresh Concrete.
4. NDR T 152 Air Content of Freshly Mixed Concrete by the Pressure Method.

**701.03 CONCRETE BRIDGE FLOORS CHECKLIST**

SSHC References:

*Section 706 Concrete Bridge Floors*  
*Section 1002 Portland Cement Concrete*  
*Section 1010 White Opaque Polyethylene Film and*  
*Burlap--Polyethylene Sheeting For*  
*Curing Concrete*  
*Section 1011 Burlap For Curing Concrete*  
*Section 1014 Joint Sealing Filler*  
*Section 1015 Preformed Joint Filler*  
*Section 1016 Preformed Polychloroprene*

@



*Elastomeric Joint Seals  
Section 1033 Aggregates*

Inspection Crew:

Project Manager  
Placement Inspector  
Plant Inspector

Inspection Equipment:

Slump Cone  
Air Meter (pressure)  
Cylinder Molds and Lids  
Rod  
Mallet  
Strike Off Bar  
Ruler  
3 m (10 ft) straightedge  
Anemometer  
Thermometer  
Hygrometer

Placement Procedures:

@

1. Preplacement check of equipment.
2. Check condition and placement of steel. **Enter in SiteManager the date steel was verified.**
3. Check Form setting and alignment.
4. Check slab thickness.
5. Check deck for cleanliness
6. Have contractor wet deck forms and grade under approach slabs before concrete placement.

(Note: It's best to place deck and approach slabs at the same time.)

7. Test concrete for air content and make cylinders when mix changes, as a minimum according to Sampling Guide.
8. Watch concrete placement for compliance with specifications.
9. Do not use water as a finishing aid; use an approved chemical finishing aid/evaporation retardant.
10. Check surface with straightedge. Remove depressions and irregularities.
11. Check tining operation.
12. Check cure operation.
13. Make sure a water service and tanks are available to soak burlap.

Construction Critical Area:

1. Take pictures of any pavement under the deck before work begins.
2. Maintain a uniform roll, of about 100 mm (4 inch), of concrete ahead of the front screed and a minimum of a 50 mm (2 inch) roll ahead of the rear screed.
3. The time between loads of concrete.
4. Trucks that segregate concrete or have cement balls must not be used.
5. Avoiding placement when temperatures and wind velocities may cause plastic shrinkage cracking.

(SSHHC Table 706.01)

6. Vibrate concrete uniformly. Establish good pattern and adjust as necessary.
7. The timing of cure application.

Safety Areas:

NDR Tests:

1. NDR T 23 Making and Curing concrete test specimens.
2. NDR T 119 Slump of Portland Cement Concrete.
3. NDR T 141 Sampling of Fresh Concrete.
4. NDR T 152 Air Content of Freshly Mixed Concrete by the Pressure Method.

#### 701.04 STEEL STRUCTURES CHECKLIST

SSHHC References:

See SSHHC Table 708.01

Other References:

AWS Standard Specifications. (ANSI/AASHTO/AWS D1.5 Bridge Welding Code)

Inspection Crew:

Fabrication Inspector  
Project Manager (PM)  
Lab Inspector

Inspection Equipment:

Skidmore-Wilhem Calibrator

Shop Procedures:

1. Check Fabricators QC Plan.
2. Make sure QC Plan is followed.
3. The mill order list or the Certified Mill Test Reports must be furnished before fabrication begins.
4. Document all actions not in compliance with the QC Plan or Standard AWS procedures.
5. Welding symbols are shown in Section 708.

Field Construction  
@ Procedures:

1. Confirm steel was inspected **on site and in shop**.  
**Enter date in SiteManager.**
2. Sample bolts and send to M&R.
3. Heavy hexhead bolts require heavy hexhead nuts and a hardened washer under the element that is turned.
4. Check all bolts, washers, and nuts to make sure there is proper and correct marking on each. (See CM Subsection 704.03)
5. M&R personnel will calibrate the contractor's wrenches but they need at least 7-days advance notice.
6. Before the contractor begins steel erection, the Project Manager will make a final check of span lengths, skew angles, and bearing point elevations.
7. Also, take pictures of pavement under any structure where equipment will be lifting members.
8. Lead sheets (3 mm (1/8 inch) thick) shall be placed between steel and concrete at all bearing points.

**702.00 EXCAVATION FOR STRUCTURES (SSHC Section 702)**

**702.01 DESCRIPTION**

All excavation should be done as shown in the plans. Excavation is very dangerous work and appropriate OSHA regulations must always be observed (see SSHC Figure 701.01).

Inspector should be present when an area is being backfilled. The inspector should check to see that the backfill materials are as specified. The materials shall be placed as prescribed in the *SSHC Subsection 205.03 or 702.03* as appropriate.

Structure excavation includes all excavation, removal of obstruction, bailing, draining, pumping, sheathing, construction and removal of cofferdams, backfilling, compacting and disposal of any excess material necessary to construct the structure in question.

**702.02 MATERIAL REQUIREMENTS**

**Unsuitable Material Excavation (SSHC Subsection 702.05)**

When unstable material is encountered it shall be removed and backfilled with approved material. The material shall be measured in cubic meters (yds) before it is placed. Payment for the extra work material and all work involved will be made at 10% of the contact unit price for box culvert concrete (when gravel or rock is used). The inspector should make an inspection of all structure footings as they are being excavated by the contractor.

@ **Pier footings should not be constructed on unsuitable material. It is true that if the footing is supported by piles, the rock placed at the bottom of the footing serves a limited structural purpose. We should provide for a solid base to hold the concrete in the forms. However, the contractor is not entitled to a rock surface on which to work at the Department's expense.**

**702.03 CONSTRUCTION METHODS**

**Culvert Excavation (SSHC Subsection 702.03)**

All culverts should be constructed with a minimum of approximately 300 mm (12 inches) of cover exclusive of surfacing. An accepted method for obtaining specified bedding for these culverts is to require the contractor to furnish a template conforming to the dimensions of the culvert pipe. This template is then used for shaping the trench to the specified depth.

The inspector must be knowledgeable of the Occupational Safety and Health Act (OSHA) requirements concerning excavation and trenching. Pipe culvert excavation by OSHA definition would normally be considered a trench.

Never allow any part of a pipe culvert to rest on rock or other unyielding materials. When rock is encountered in the bottom of the trench, it shall be removed to a depth of at least 150 mm (6 inches) below the subgrade and back filled with suitable earth or sand.

The Specifications provide that where unstable subgrades are encountered under pipes or pipe-arch culverts, the unsuitable material shall be removed and the excavated area refilled with gravel, crushed rock, or other suitable material. When crushed rock is used, care should be taken to place the fine rock immediately beneath all metal pipe to prevent abrasion of the spelter coating. When gravel or crushed rock is used in place of unsuitable material, it will be measured in cubic meters before it is placed. Payment for furnishing, hauling and placing this material will be made at 10% of the contract unit price for concrete for box

@ culverts. When box culverts are not included in the contract, the **average** unit price for box culvert concrete shall be used. (*SSHC Subsection 702.05*)

**General Structure Backfilling** (*SSHC Subsection 702.03*)

This operation may involve *SSHC Sections 205, 702, and Table 702.01*. The inspector should insure that all applicable sections are followed. The compaction of backfill material close to structures must given special attention. Mechanical tampers should be operated carefully in such a manner as to obtain the required density without damaging the structure.

Before any material is placed, the area to be backfilled should be inspected for trash or perishable matter. The materials to be used for backfill should be given careful consideration. Only those that will produce a dense, well-compacted backfill should be used. Granular materials are desirable as much less effort is needed to compact them than clay.

When abutments are tied to an anchor or deadman by means of tie rods, care should be taken in the back filling operation. The backfill should be placed in layers, starting at the anchor or deadman and working toward the abutment. Hand tamping may be required around the tie rods, abutment and anchors.

Backfilling must not be started without the permission of the Project Manager and in the case of concrete structures not until test cylinders show a minimum strength of at least 80% of the design strength.

Backfill should be brought up evenly to the elevation shown in the plans. Granular material must be placed in not more than 200 mm (8 inch) layers (lifts) and should have sufficient moisture to facilitate compaction. Do not allow dumping of granular material directly from the truck into the excavation if this will result in lifts/layers greater than 8 inches.

Special attention should be given to culvert wingwalls and flumes to insure proper compaction to prevent erosion and possible washout. The soil should be brought up even with these walls so the surface water will flow over these walls and not along them. Heavy equipment should be kept 1 m (3 feet) or more away from these wingwalls. Compaction within 1 m (3 ft) of the wingwall shall be with pneumatic hand tampers or small hand operated vibratory plate compactors.

Backfill for Bridges - Moisture and density requirements for backfill which is to provide support for subsequent construction will be shown in the plans. Backfill which is not to support later construction shall be compacted to 95% of maximum density without definite moisture limits.

Backfill for Culverts - When backfilling pipe culverts, the lifts shall be deposited and compacted alternately on opposite sides of the pipe to avoid lateral displacement. The inspector should also watch for vertical displacement. This may occur when tamping adjacent to the lowest 90 degrees of the pipe and should be checked from the grade stakes as backfilling progresses. The pipe should be tied down if any uplift is noted.

Necessary precautions should be taken against washing under the pipe in case of rain. Compacted dikes or temporary earth headwalls at the inlet end will often save removing and relaying the pipe after a heavy rain. All drainage structures in the process of construction should be carefully inspected for washouts at the sides and beneath the structures after rains.

Flowable fill is sometimes included in the plans for backfilling culverts. The plans will identify the locations and show the details for using the flowable fill. *SSHC Section 1003* defines Flowable Fill requirements.

#### **Concrete Seal Course (*SSHC Subsection 702.03*)**

- @ When it is impossible to dewater the foundation bed or box culvert footing or if live springs develop within the area, a seal course should be constructed below the elevation of the bottom of the footing. Concrete for seals constructed underwater shall contain 10% excess cement and be placed in accordance with *SSHC Subsection 704.03*. The concrete shall be allowed to harden a minimum of 72 hours after completing the final pour before dewatering and continuing work on the structure.
- @ Seepage through inadequate or poorly constructed cofferdams shall not be justification for placing a seal course.

### **Foundations**

#### **Staking and Checking Locations of Structures**

##### **Check and Double Check**

- All measurements and skew angles must be independently checked. From past practice, "independently checked" meant having a second survey party come in, setup, and completely resurvey (verify) original staking. This method is still the most desirable; however, with our upgrading to total station equipment it is acceptable to either setup off to the side and recheck or "back into" the bridge starting up station after clearing the total station.
- Stakes used should be substantial and protected from disturbance. Offset stakes for each pier and abutment must be placed outside the area of contemplated work.

Any checks suggested by the contractor should be considered, since the site superintendent usually has a good idea of the structure layout in relation to existing features such as trees, old structures, etc. Each stake must be clearly marked to denote its function. Pier numbers must correspond with plan designations.

##### **Documentation**

A staking diagram for each structure must be recorded in a permanent survey field book. This sketch must show the exact location of each hub and the markings made on each guard stake. IT IS NOT COMPLETE UNLESS IT SHOWS THE MEASUREMENTS MADE AS CHECKS ON THE ACCURACY OF THE STAKING LAYOUT. Names of those in the staking party should be entered as well as the date, design and project numbers, location, type of structure, and any other pertinent information.

##### **Common Survey Errors to Avoid**

- A. Turning the wrong skew angle.
- B. Errors in measuring from piers to abutments (This should be detected by an overall check from abutment to abutment.)

**703.00 PILING AND PILE DRIVING (SSHC Section 703)**

@ The Department's Geotechnical Section in the Materials and Research Division provides guidance and geotechnical designs for our projects. Some county bridge projects are completely designed by consultants including pile foundations. When a consultant design fails, i.e., bearing cannot be achieved, the consultant that designed the bridge should be the first point of contact to determine how to correct a failed design.

**703.01 EQUIPMENT**

**Diesel Hammers**

Generally, single acting diesel hammers are the mainstay of contractors for pile driving. Occasionally however, a contractor will request the use of an "air" or "hydraulic" operated hammer. In addition there are a few "double acting" hammers in use. A wave equation analysis will be required for approval of these hammers.

One manufacturer of hammers uses one size hammer barrel and places different sized rams inside. Therefore, the MKT "DE" series hammers need to be field verified for ram mass (weight). A check is accomplished by having the contractor stand the hammer upright (in the driving position) and measuring down from top of the barrel to top of the ram. Verify the ram mass (weight) shown on the Hammer Data sheet as follows:

Ram Mass (kg)	Ram Distance (meter)	Ram Mass (tons)	Ram Distance (ft)
907	1.9	1	6.25
1270	1.2	1.4	4.0
1497	0.7	1.65	2.3
1814	180 mm	2.0	0.6

**Bearing and Penetration**

**Penetration Requirements**

Design pile length is a calculated value based on design bearing and soil conditions. One factor which enters into the calculation is the potential for scour. Obviously, any soil which is eroded during a flood event represents a loss in bearing capacity and foundation stability.

**For this reason "minimum penetration" is extremely important.**

A depth of expected scour is typically shown on the Bridge Geology sheet in the plans. In general, streams with large drainage areas and sand or gravel stream beds are quite susceptible to scour while streams with small drainage areas and heavy clay stream beds are less susceptible to scour.

When doubt exists concerning the amount of probable scour or minimum pile penetration required, the Construction Division should be consulted. If greater penetration is required, it will be achieved either by boring holes to receive the piles or by jetting. If penetration achieved is satisfactory, piles will be cut off.

**Dynamic Pile Analyzer**

@ The Materials & Research Division has a pile analyzer available for driving evaluations. The pile analyzer will evaluate the bearing, based on energy delivered to a pile as it is being driven.

There are two situations where the analyzer should be used:

Case 1. Contract documents require pile to be driven with the analyzer.

Case 2. Pile do not achieve bearing and there are unresolvable questions or conditions observed during driving.

## 703.02 CONSTRUCTION METHODS

### Pile Driving Constraints

Piles shall not be driven within 15 m (50 ft) of freshly placed concrete. Normally piles may not be driven near new concrete until three days after the concrete was placed.

### Splicing Pile--Welding Steel Pile

SSHHC Section 708 requires that all welds conform to the Structural Welding Code ANSI/AASHTO/AWS D1.5 of the American Welding Society.

@

@

Only Shielded Metal Arc Welding (SMAW) will be permitted for welding steel piles.

The welding electrode must be on the NDR Approved Products List.

### Steel Pile Cutoffs

If the contractor feels the cutoff is long enough that they may use it on some future project, the Heat number should be placed on the cutoff and a number to indicate the project it came from.

@

### Pile Groups/Categories

Selecting the type of pile to be used and estimating its necessary length are fairly difficult tasks that require good judgement.

Piles can be divided into two major groups, depending on their length and the mechanisms of load transfer to the soil:

#### 1. Point Bearing Piles

If bedrock is within a reasonable depth, then piles can be extended to the rock and achieve the ultimate bearing capacity.

#### 2. Friction Piles

The ultimate bearing capacity is achieved through the skin friction. The length of friction piles depends on the shear strength of the soil, the applied load and pile size. In clayey soils, the resistance to applied load is caused by adhesion.

Piles are also divided into two different categories depending on their interaction with the soil:

#### 1. Displacement Pile:

The effect of displacement pile on the soil is, it increases the lateral ground stress. It displaces cohesion-less soils, remolds and weakens cohesive soils temporarily. If displacement piles are used for cohesive soil, setup time in sensitive clays may be up to six months.

Typical types of displacement piles are closed end steel pipe pile and concrete pile.

#### 2. Non-displacement Pile:

Opposite of the displacement pile, it minimizes disturbance to the soil.

Typical types of non-displacement piles are open-end steel pile and steel H pile. It should be mentioned open steel pipe is not suited for friction piles in coarse granular soils.

It has low driving resistance and this makes field capacity verification difficult, which result in excessive pile length.

### Weights of Prestressed Concrete Bearing Piling

For computing bearing capacity required on **M&R Pile Record spreadsheet**

@

Pile Type	Constant Section	Tapered Section
	Wt. per Lin. Ft. (Pounds)	Total Weight (Pounds)
I	148	None
II	200	None
III	173	None
IV	212	None
V	124	1740
VI	169	2500
VII	221	2950

This table is based on and is for use only with Standard Plan 1720-C-R2.

### Steel Pipe Pile Data

	ARMCO		Union Metal
	Size O.D. (ins)	12	12¾
Wall T. (ins.)	.188	.188	7 Ga.
Wt. per Lin. Ft. (lbs.)	23.72	25.16	25.3
Conc. per Lin. Ft. (C.Y.)	.0273	.0309	.0255

Union Metal 30' tapered Sec. Type F Total Wt. 589 Lbs. Conc. 0.55 Cu. Yd.

Size O.D. (ins)	14	14 (Nominal)
Wall T. (ins.)	.188	7 Ga.
Wt. per Lin. Ft. (lbs.)	27.66	29.5
Conc. per Lin. Ft. (C.Y.)	.0375	.0350

Union Metal 40' tapered Sec. Type F Total Wt. 895 Lbs. Conc. 0.95 Cu. Yd.

@

For Raymond step tapered pile, contact **Omar Qudus, Materials & Research.**

### Driving Sequence of Piles

The driving sequence of piles in a pier or bent can be important. The driving sequence can affect the way piles drive as well as the influence the new construction has on adjacent structures. This is especially true for displacement piles. For non-displacement piles, the driving sequence is generally not as critical.

The driving sequence of displacement pile groups should be from the center of the group outward or from one side to the other side. The preferred driving sequence of the displacement pile group shown in Figure 24.16 would be (a) by the pile number shown, (sequence 1), (b) by driving each row starting in the center and working outward (sequence 2), or (c) by driving each row starting on one side of the group and working to the other side (sequence 3).

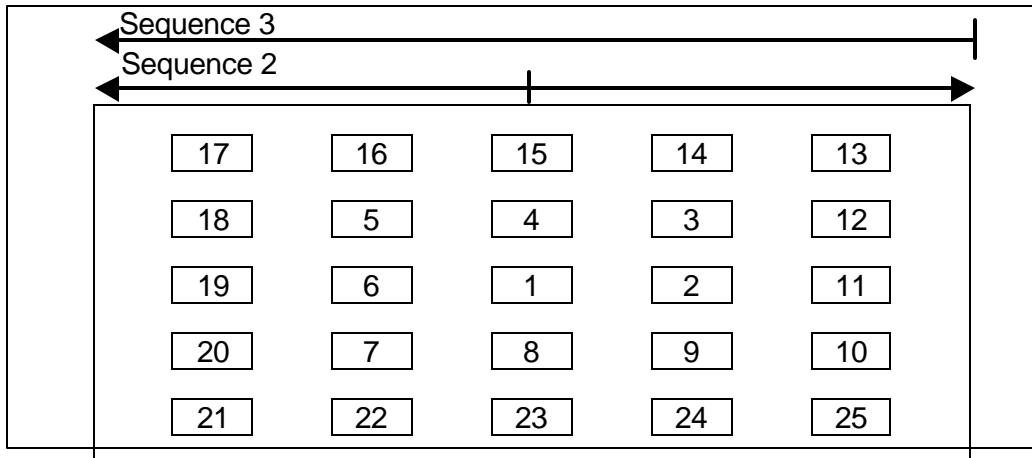




Figure 24.16 Driving Sequence of Displacement Pile Groups (after Passe, 1994)

4. The pile cushion should be of correct type material and thickness for concrete piles.

The purpose of the pile cushion is to reduce high compression stresses, to evenly distribute the applied forces to protect the concrete pile head from damage, and to reduce the tension stresses in easy driving. Pile cushions for concrete piles should have the required thickness determined from a wave equation analysis but not less than **4 inches (100 mm)**. A new plywood, hardwood, or composite wood pile cushion, which is not water soaked, should be used for every pile. The cushion material should be checked periodically for damage and replaced before excessive compression (more than half the original thickness), burning or charring occurs. Wood cushions may take only about 1,000 to 2,000 blows before they deteriorate. During hard driving, more than one cushion may be necessary for a single pile. Longer piles or piles driven with larger hammers may require thicker pile cushions.

5. Predrilling, jetting or spudding equipment, if specified or permitted, should be available for use and meet the requirements. The depth of predrilling, jetting or spudding should be very carefully controlled so that it does not exceed the allowable limits, usually 10 feet (1 m). Predrilling, jetting, or spudding below the allowed depths will generally result in a reduced pile capacity, and the pile acceptance may become questionable.

6. A lead system must be used.

The leads perform the very important function of holding the hammer and pile in good alignment with each other. Poor alignment reduces energy transfer as some energy is then imparted into horizontal motion. Poor alignment also generally results in higher bending stresses and higher local contact stresses which can cause pile damage. This is particularly important at end of driving when driving resistance is highest and driving stresses are generally increased.

### **INSPECTION OF DRIVING EQUIPMENT DURING INSTALLATION**

The main purpose of inspection is to assure that piles are installed so that they meet the driving criteria and the pile remains undamaged. The driving criteria is often defined as a minimum driving resistance as measured by the blow count in blows per inch. The driving criteria is to assure that piles have the desired capacity. However, the driving resistance is also dependent upon the performance of the pile driving hammer. The driving resistance will generally be lower when the hammer imparts higher energy and force to the pile, and the driving resistance will be higher if the hammer imparts lower energy and force to the pile. High driving resistances can be due either to soil resistance or to a poorly performing hammer. Thus, for the inspector to assure that the minimum driving criteria has been met and, therefore, the capacity is adequate, the inspector must evaluate if the hammer is performing properly.

Each hammer has its own operating characteristics; the inspector should not blindly assume that the hammer on the project is in good working condition. In fact, two different types of hammers with identical energy rating will not drive the same pile in the same soil with the same driving resistance. In fact, two supposedly identical hammers (same make and model) may not have similar driving capability due to several factors including differing friction losses, valve timing, air supply hose type-length-condition, duel type and intake amount, and other maintenance status items. The inspector should become familiar with the proper operation of the hammer(s) used on site. The inspector may wish to contact the hammer manufacturer or supplier who generally will welcome the opportunity to supply further information.

**704.00 BRIDGES (STEEL STRUCTURES) (SSHC Section 708)**

**704.01 DESCRIPTION**

This work includes the furnishing, preparing and erecting of all riveted, bolted or welded structures in which the main members spanning the supports are composed of steel.

**704.02 MATERIAL REQUIREMENTS**

Members of steel structures that are fabricated in the shop are inspected by NDR personnel before they are shipped to the job site. In some cases, when the fabrication is done outside of the state, the inspection will take place after delivery to the site of work. The Project Manager should have a copy of the shop inspection report and the mill test report before allowing the erection of any portion of the structure. Miscellaneous parts of the superstructure such as high tensile steel bolts will require field inspection and sampling according to the "*Materials Sampling Guide*".

Field welding may require the use of special welding electrodes as designated in the plans, specifications, or special provisions. Some of these welding electrodes may require special care and handling before their use will be permitted. (See SSHC Section 708.) **Enter date steel is verified in SiteManager. Occasionally wrong size is delivered.**

@

**Concrete Industries rebar shipments will be documented to show bending details, heat numbers, quantity and project location by stationing.**

@

**704.03 CONSTRUCTION METHODS**

**Falsework (SSHC Subsection 704.03)**

**Temporary Fastenings**

Contractors often request permission to use anchor supports for face forms, concrete curbs, Jersey barriers, raised medians on bridges. Any contractor desiring to use a temporary floor fastening may be allowed to use only some form of weakened section bolt or tie, cast in the floor. The weakened section must be so positioned that when broken off the break will be recessed below the surface. The resulting void must be patched with mortar.

NOTE:

1. No bolt without a weakened section may be used.
2. No holddown device shot into the floor will be allowed.

**Falsework Plans**

SSHC Subsection 704.03, paragraph 7.f. requires the contractor to submit 3 copies of falsework plans when required or **when** certain conditions apply. These plans shall be prepared by an Engineer registered in the State of Nebraska. The contractor shall prepare falsework plans, as called for in plans or in the special provisions, and for:

@

- Support of plastic concrete for concrete slab bridges with spans greater than 15.25 m (50 ft) in length.
- Cast-in-place concrete girders.

SSHC Section 1058 requires high tensile steel bolt, nut and washer material for structural steel joints to meet the requirements of ASTM Designation A 325/A 325M.

When heavy hexhead structural bolts and heavy hexagon nuts are used, a hardened washer is required only under the bolt head, or nut, whichever is the element being turned. Bolts and nuts may be washer faced, but these faces do not take the place of a hardened washer.

Heavy hexhead structural bolts manufactured to ASTM A 325/A 325M, Types 1, 2 and 3, the dimensions for which are shown in the ASTM tables, are identified on the top of the head by the legend "A 325", and the manufacturer's symbol.

Type 1 bolts, at the option of the manufacturer, may be marked with three radial lines 120 degrees apart.

Type 2 bolts shall be marked with three radial lines 60 degrees apart. Type 3 bolts shall have the "A 325" underlined and the manufacturer may add other distinguishing marks indicating that the bolt is of a weathering type.

Heavy hex nuts for A 325 bolts are identified on at least one face by the manufacturer's mark and the number "2" or "2H", by three equally spaced circumferential lines, or by the legend "D" or "DH". Heavy hex nuts for A 325 Type 3 bolts shall be marked on one face with three circumferential marks and the numeral "3", in addition to any other distinguishing marks the manufacturer may elect to use.

Washers for A 325 Type 3 bolts shall be marked on one face near the outer edge with the numeral "3", or other distinguishing marks indicating that the washer is of a weathering type.

The marking on bearing surfaces of nuts and washers shall be depressed.

According to the specifications, high strength steel bolts may be installed by the turn of the nut method. It should be noted that the equivalent torque values given in SSHC Table 708.03 are experimental approximations and that the footnote to this table required that the torque-tension ratio be determined under actual conditions of the application.

@  
@  
Wrenches will be calibrated and the torque-tension ratio will be determined at the site by Materials and Research Division personnel. The Construction Engineer should be notified as early as possible as to the time when the wrench and representative bolts will be present at the site in order that arrangements may be made to have appropriate personnel travel to the site and calibrate the wrench and establish the torque-tension ratio.

@  
@  
When Materials and Research Division personnel have calibrated the wrench and determined the torque-tension ratio, the bolt tension calibrator will be left with the project personnel so that the wrench calibration may be checked as the work goes on. Impact wrenches should be checked on a daily basis and manual torque wrenches at any time that, in the opinion of the Project Manager, conditions have varied from those present during the initial calibration.

Impact wrenches should be calibrated under the same conditions, such as length of hose and power supply, that were present during actual installation of the bolts.

@ SSHC Subsection 708.03, Paragraph 10.h. Turn-of-Nut method shall be followed for tightening all high strength fasteners.

High Strength bolts and nuts, which have been torqued as outlined below, shall not be reused. This includes both black and galvanized bolts and nuts.

A. Bolting

Receiving Shipments

Prior to installation, check shipping certifications and compare these to bolting kegs on site. Check for size, length, heat numbers, and general fastener condition i.e., rusted black bolts or non-lubricated galvanized nuts.

@ Rotational-Capacity (RC) lots will need to be checked.

Installation Checklist

- A pre-bolting meeting is strongly recommended/encouraged. Bolting procedures, Turn-of-Nut process described below, and the inspection process need to be discussed.
- Site storage of fasteners is important. Storage should be in a sealed container within a sheltered storage shed.
- Black bolts and nuts shall be oily to the touch when delivered and installed.
- Galvanized nuts shall be checked to verify lubrication. A uniform dye color indicates lubricant has not been damaged. If there is no color, or color is not uniform, bolts and nuts shall be field lubricated with bees wax, stick wax, or other approved dry wax prior to installation.
- Rusted or dirty bolts or nuts shall be cleaned and relubricated prior to installation.
- Faying surfaces shall be free of burrs and foreign material; and bolted faying surfaces are to be painted with zinc rich paint.
- All fasteners shall be free of dirt, moisture, rust, and be "well" lubricated.
- Washers (when required) are to be placed under the **"turned element."**
- Often contract documents will specify which way a bolt is to be installed. If there is no specific guidance, threaded ends of bolts will be turned inside and away from normal exposure to pedestrian and/or vehicular traffic for aesthetic reasons.
- During installation, particular care should be exercised so a snug-tight condition is achieved.

rotation has been made considering tolerances given at the bottom of the nut rotation chart.

E. Inspection Wrench Calibration

1. Tension Measuring Calibrated Devices

Tension measuring calibrated devices (typically Skidmore-Wilhelm Calibrator) are calibrated to a high degree of accuracy, but can lose some of this accuracy after an extended period of time. Contractors can have the devices calibrated by the Materials & Research Laboratory.

When each device is calibrated, a calibration sheet will be issued indicating the date the test was performed. Contractors must keep the calibration sheet with the tension-measuring device.

Attentiveness needs to be exercised when using this Calibration Sheet. The inspector needs to check the sheet and compare the "Indicated Load on Gauge" column to those values listed in the "AVG" column under "Actual Load on Testing Machine." These are usually **NOT** the same.

**NOTE: Be sure to take any difference (INDICATED versus ACTUAL) into account when calibrating the Job Torque Wrench!**

2. Torque Wrench Calibration

At least once a day, three bolts of the same grade, size, and condition as those used in the structure shall be placed individually in a calibration device capable of indicating bolt tension. A washer shall be used under the part to be turned.

**NOTE: There must be 3-5 threads exposed behind the nut. Check and add washers if required. For longer bolts, steel shim plates should be used.**

- a. Tension bolt to 100 percent of "Minimum Bolt Tension" listed for a particular bolt diameter. Tension is read directly from the tension measuring calibrated device as corrected by accounting for differences between INDICATED versus ACTUAL. (Refer to *SSHC Subsection 708.03* for "Minimum Bolt Tension.")
- b. Apply inspection torque wrench, rotate nut or bolt and increase tension by an additional 5%. Remember, a dial type wrench must be set to zero before checking torque. Record the inspection wrench's "TORQUE" when 105% of the tension is achieved.

**NOTE: The turned element must be moving to indicate the correct torque.**

### **Pot Bearings**

@ The Materials and **Research** Division inspects pot bearings at the site. In order to facilitate the work, we request that the Materials and **Research** Division be notified immediately when the pot bearings arrive at the site. This will permit Materials and **Research** personnel to inspect the bearings in a timely manner.

@ The person to notify is Mr. Mark Burham at Materials and **Research**. His phone number is (402) 479-4746.

### **Painting (SSHC Section 709)**

#### **A. New Non-Weathering Structural Steel**

- Shop applied paint system shall be used for non-weathering steel bridges.
- A field applied "top coat" is usually required. A top coat will also be required when it is deemed necessary due to aesthetics.
- The contractor will be required to touch-up any damaged areas after erection. Touch-up or top coat paint system shall be the same paint as the shop coat.

#### **B. New Weathering (ASTM A 588) Structural Steel**

The plans require shop applied prime paint to selected areas on the structure. They also require:

- The approved paint system.
- Only paint where shown in the plans with approved paint system.
- The contractor to touch-up any damage to primed areas after erection prior to top coating. This includes bolts in those areas. Touch-up paint shall be the same paint as the shop coat.

#### **C. Field Painting**

Field painting of structural steel shall be done as shown in the plans and special provisions.

### **704.04 METHOD OF MEASUREMENT**

Structural steel for handrail is measured by the pound. Ornamental handrails are measured by the lineal feet of rail between end posts. These values are listed on the plans and may be used in the final computation for payment.

## **704.05 BASIS OF PAYMENT**

PMs are authorized to pay for steel plates and shapes as soon as the material arrives at the fabricator.

The Nebraska Department of Roads had determined that it may be possible to improve inspection procedures and to lower construction costs on bridges and other structures where significant quantities of steel are required if stockpiled materials are paid for upon receipt by the fabricator. Therefore, the Department will allow partial payments for stockpiled steel plates and shapes prior to fabrication. The procedure that must be followed before partial payment will be made is as follows:

1. The prime contractor must request partial payment from the Department's Project Manager for the specific project where payment is requested.
2. The fabricator must provide the Department's Project Manager the steel manufacturer's paid invoice for the material. The Project Manager will make the payment for the amount shown on the invoice, which directly is attributed to the project for which payment is being considered. The invoice should be annotated to show:
  - the project number;
  - steel quantity in pounds applicable to the project;
  - material grade;
  - material heat number.
3. There must be identifying marks placed on each piece for which payment will be made.
4. Steel must be stored in orderly fashion to readily facilitate identification of specific materials to specific projects. Project materials cannot be commingled with other projects – each project's materials must have a separate location.
5. The Manufacturer's Certified Mill Test Reports must be provided to the Department before payment will be authorized.
6. The Department will verify that the material is properly stored before payment will be made.
7. The Prime Contractor will make payment to the fabricator within 20 days after the Department has paid for the material.
8. Payment is only authorized for materials that are stored within Nebraska as specified in Subsection 109.07 of the Nebraska *Standard Specifications for Highway Construction*.



**705.00 REINFORCEMENT (SSHC Section 707)**

**705.01 DESCRIPTION**

The reinforcement of concrete for structures consists of furnishing and placing deformed metal reinforcing bars or welded-wire fabric in the concrete as required by the plans and specifications.

**705.02 MATERIAL REQUIREMENTS (SSHC Subsection 707.02)**

Samples of reinforcing steel and welded-wire fabric are required by the Central Laboratory unless these materials are shipped from tested stock. Generally reinforcing steel has been sampled and tested before shipment to the project, and will arrive with acceptance tags attached. At the time this steel is placed in the work, the structure inspector should collect, record in field book, and submit the tags to the Project Manager. Steel arriving untagged should not be incorporated in the work until approved by the Materials Engineer. See the "*Materials Sampling Guide*".

@ The Materials and **Research** Division requires that 2 (two) 2.0 m (6 ft) sample lengths of epoxy-coated reinforcing steel be submitted for testing purposes, and a special provision to that effect will be included in future contracts.

Similarly, the *Materials Sampling Guide* requires 2 (two) 2.0 m (6 ft) sample lengths for uncoated reinforcement bars be provided (unless shipped from tested and approved stock).

@ **Enter the date resteel is verified on-site in SiteManager.**

**705.03 CONSTRUCTION METHODS (SSHC Subsection 707.03)**

**Placement and Checking (Bridge Deck)**

Bridge plans specify nominal slab thickness and nominal clearance of reinforcing bars from face of the concrete. This section will establish acceptable deviations from nominal plan dimensions.

Four dimensions must be given special attention when checking placement of bridge slab reinforcing:

1. Slab thickness.
2. Clearance of bottom reinforcement from bottom of slab.
3. Distance from bottom of slab to top of top mat of reinforcement.
4. Cover over top mat of reinforcement

**Slab Thickness**

This shall be the nominal slab thickness shown on the plans with a tolerance of minus zero and plus 13 mm (1/2 inch).

D. Checks During Placement

Checks of slab thickness and cover over top reinforcement must be made in the finished concrete directly behind the finish machine. A thickness and cover check should be made at the same location of an approximate grid of 3 m (10 ft) transverse and 6 m (20 ft) longitudinal. These checks must be documented in the field book. When the slab is of deficient thickness or cover checks indicate incorrect rebar placement corrections must be made immediately.

E. Cleaning Forms and Steel

Mud and other foreign material must be removed from the steel and forms prior to placement. Remove any trapped/ponded water before placing the concrete.

**Epoxy-Coated Reinforcement** (*SSHC Section 1021*)

Epoxy coatings are applied to reinforcing bars by a fusion-bonded process. This means the coating achieves adhesion to the bar as a result of a heat-catalyzed reaction. Besides chemical adhesion, there is also physical adhesion of the coating to the bar.

**Care and Handling**

Epoxy coated bars are subjected to many quality control tests and inspections prior to leaving the supplier's facility. However, from that point forward, careless handling and construction practices can cause excessive coating damage. Contractors should be strongly encouraged to exercise care in handling, storage, and placing of epoxy coated bars. If problems are noted after delivery, the inspector is to contact the Materials and **Research** Division.

@

A. Handling

During unloading epoxy coated bars from the truck, care must be exercised to minimize scraping of the bundles or bar-to-bar abrasion from sags in the bundles. Skidding bundles from the truck onto the ground should not be allowed. Use of power hoisting equipment for unloading and handling is strongly encouraged. Further, equipment for handling the bars should have protective contact areas. Specifically, nylon slings or padded wire rope slings should be used and bundles should be lifted at multiple pick-points.

B. Storage

Epoxy coated bars should be stored on timbers or other suitable protective cribbing. All types of reinforcing bars should be stored off the ground as close as possible to the area where they will be used. The following storage practices are suggested to prevent damage:

1. Store bars above the ground on timbers, cribbing, or dunnage placed close enough together to prevent sags in the bundles.
2. If a large quantity of bars has to be stored in a small area, bundles can be stacked if adequate blocking is placed between the layers.

along a rib. In most instances, the thickness of the epoxy coating will be very low in these areas or there may be no coating at all where the sharp edges are present.

- @ Materials and Research Division personnel will inspect epoxy coated rebars at the coating applicator's plant in some, but not, all cases. In cases where inspection is made at the applicator's plant, the bars will have a maximum of two holidays per meter, plus handling damage, is allowed, when they arrive at the site. In addition, the coating thickness, on bars inspected at the applicator's plant, must meet the specification requirements for thickness of coating. Bars not so inspected at the applicator's plant will have an unknown number of holidays and possibly uncoated sharp edges plus handling damage when they arrive at the site and, in addition, the coating thickness will not have been checked. Bars that contain rolling defects or have uncoated sharp edges that are found during the inspection shall be rejected.
- @

The basis for acceptance will be the total of defects per 300 mm (foot) of bar, i.e., holidays plus handling defects as located with the electronic detector.

- @ A total of six defects in any 300 mm (foot) of the bar will be permitted. As an example, in a bar of given length, if any 300 mm (foot) section of that bar has no more than the two allowable holidays and four handling defects, the bar is acceptable, providing none of the four handling defects has an area greater than 0.0025 ft.<sup>2</sup> (225 mm<sup>2</sup>). [A square measuring 15 mm x 15 mm (0.05 ft x 0.05 ft) has an area of 0.0025 ft.<sup>2</sup> (225 mm<sup>2</sup>)]. All handling defects having an area greater than 225 mm<sup>2</sup> must be repaired.

The following points may be helpful in the inspection and repair of epoxy coated rebars in the field.

1. Inspect bars for coating defects, using the electronic detector, as they come out of the bundle.
2. It may not be necessary to check all bars in each bundle, but enough bars out of each bundle should be checked in order to determine the quality of coating on all bars in the bundle.
3. When the number of defects per 300 mm (1 foot) section exceeds six, only the number of defects necessary to bring the bar into compliance need be repaired. Only exception is that all defects greater than .035 mm<sup>2</sup> (.00005 in<sup>2</sup>) must be repaired.
4. Repair of defects is accomplished with an approved two component epoxy compound supplied by the coating manufacturer.
5. Epoxy compounds used for repair have a minimum temperature at which they may be used and a limited pot life, as recommended by the manufacturer.
6. Any rust showing through the defect must be removed before applying the epoxy compound. A file or grinding wheel may be used provided no substantial reduction in the area of the bar occurs.
7. Coating thickness of the painted repair area must be as specified for the factory applied coating.

## Splicing

All reinforcement shall be furnished in the full lengths indicated in the plans. Splices, not shown in the plan, shall not be allowed without approval of the Project Manager. Welding shall be allowed only if shown in the plans or authorized by the Construction Engineer in writing.

When splices are required, they should be staggered as far as possible in order that a plane of weakness is not caused in the member. The laps should be at least as long as is shown in the plans and if no lap is shown, the bars should be lapped as required in **SSHC Subsection 707.03**. Splices should preferably be made in areas of low stress concentration. The bars in the top of a slab or beam should be spliced in a positive moment section (bottom of slab or beam in tension) and the bars in the bottom of a slab or beam should be spliced in a negative moment section (top of slab or beam in tension). For example, the longitudinal bars in the top of a slab should be spliced near the center of the span rather than over a pier and the longitudinal bars in the bottom of the slab should be spliced near the pier rather than in the middle of a span. Following is a tabulation of 24 and 36 diameter lap requirements for the various sizes of rebars.

ASTM Standard Reinforcing Bars				
		Nominal Dimensions - Round Sections		
Bar Size Designation	Weight Pounds per Foot	Diameter Inches	Cross-Sectional Area - Sq. Inches	Perimeter Inches
#3	.376	.375	.11	1.178
#4	.668	.500	.20	1.571
#5	1.043	.625	.31	1.963
#6	1.502	.750	.44	2.356
#7	2.044	.875	.60	2.749
#8	2.670	1.000	.79	3.142
#9	3.400	1.128	1.00	3.544
#10	4.303	1.270	1.27	3.990
#11	5.313	1.410	1.56	4.430
#14	7.650	1.693	2.25	5.320
#18	13.600	2.257	4.00	7.090

**706.00 CONCRETE CONSTRUCTION (SSHC Section 704)**

**706.01 DESCRIPTION**

This section of the Specifications deals with the construction of structures composed of portland cement concrete. This work includes constructing, setting and supporting the forms, and handling, placing, finishing and curing the concrete for bridges, box culverts, arch culverts, headwalls, retaining walls and steps, and the miscellaneous structures listed in the incidental construction portion of the Specifications.

**706.02 MATERIAL REQUIREMENTS**

**Composition of Concrete**

The class of concrete to be used in the work is specified in the plans or special provisions and shall be one of those described in *SSHC Subsection 1002.02*. In the event that the contractor has a choice of several classes, he/she is required to advise the Project Manager by letter of the one to be used. This information should be obtained prior to any concrete construction to allow engineering personnel to make provisions for necessary inspection and testing. The contractor may not change classes of concrete during construction without the written permission of the Project Manager.

*SSHC Subsection 1002.03* prescribes requirements for concrete materials. The Contractor's responsibility for material requirements may be summarized as follows:

- @
1. Check with Materials & Research as to the approval of cement, coarse aggregate, fine aggregate, air-entraining agent and curing compound.
  2. Submit samples of non-approved materials to the Central Testing Laboratory in sufficient time before use to allow time to receive results. The size and frequency of samples are provided in the "*Materials Sampling Guide*".
  3. Materials for which approval has not been received must not be used in the work.

The inspector is concerned not only with the approval of materials but also with the storage of materials. Bag cement shall be stored in a dry location. If stacked more than 8 bags high for a period of time the lower layers take on a "warehouse set" and should not be used. Cement stored over 90 days must be retested before use.

**706.03 CONSTRUCTION METHODS**

**Use of Ready Mixed Structural Concrete**

**Prepour Meeting**

It is very important to use the prepour meeting to discuss the specifics of placement, establish communication, and resolve potential "sticky" issues prior to placement. Generally it is recommended to discuss:

- Chain-of-command. Who is in charge for the contractor? Who needs to be notified if material tests do not comply with specifications? Establish prior to placement how test

results are reported (i.e., does the Contractor want to be notified verbally, or in writing each time?).

- @ • **More cement paste will cause more cracks and less paste means fewer cracks.**
- Material requirements and admixtures needed for the placement (Examples: Single cement source, concrete temperature and methods used to cool the mix, source and amount of any admixtures, specific mixes required for bridge decks, etc.)
- @ • **Vibration can make a stiff mix workable with better results than adding water.**

Procedures for introducing admixtures during mixing operations need to be discussed and formalized. For example: How and where will the air entraining agent be introduced? There is a growing concern that placement location of admixtures is causing significant variability in mixes. The plant monitor must watch and document how admixtures are introduced during mixing.
- Method and frequency of acceptance testing during any placement. Inform the Contractor what is expected if non-acceptable material is found during placement.
- Scheduling, truck availability, placement method, and required placement rates.
- Establish an acceptable source of preplacement weather forecasting. Agree on weather parameters which will be used for "go" or "no-go" decisions both "prior to" and during the placement activity.
- @ • **Larger limestone aggregate will reduce deck cracks. The gradation tables all have tolerances. Make sure we get as large of limestone aggregate as is available.**

### Inspector's Checklist

- A. Specifications regarding plant inspection, equipment approval, and batching operations should be reviewed for familiarity. **In addition to proper plant calibration, the inspector should verify that each truck mixer used on the job has a current certification as required by SSHC Section 1002.** It is good practice to inspect a random sample of ready mix trucks that will be used on the job, verifying that the certification accurately reflects the truck's condition. Truck certification numbers should be recorded in the inspector's diary and will need to be reverified at least every 30 days.
- B. Batching and mixing should be limited to the lead truck until slump and air content have been tested for conformance with specifications. **Contractors may make preliminary tests at the plant but project acceptance is based on job site tests.** It is intended that the ready mix plant supply concrete to the construction site that conforms to all applicable specifications at the point where the acceptance sample is taken.
- SSHC Table 1002.02, Concrete Proportions, lists slump and air content requirements.*
- If concrete is being delivered which deviates much from these target values, the contractor is responsible for taking corrective action to bring the mix to within target values. Even if the current mix is within specified limits. The intent of the tolerance is to provide latitude during placement for unforeseen changes in materials, mixes, and placement methods. Placing concrete "consistently" near a tolerance limit is not desirable and warrants additional sampling.
- What is important, is the contractor's response to test results approaching tolerance limits. Continually having to add water and/or air agent to each load at the site will

not be permitted. If such practice is occurring, the inspector shall notify the contractor (or whomever was designated as "the" responsible individual in charge of the concrete at the site.) Ultimately, it is the contractor's responsibility to initiate immediate corrective action.

Non-responsiveness on the contractor's part is reason to initiate sampling and testing of each truck or halt placement. The purpose for additional testing is to ensure that no noncomplying materials are incorporated into the project.

In some cases admixtures, such as water reducers, are required to be added in split doses or sometimes totally at the site.

C. All Structural Concrete

- At the start of each day's placement, no concrete is to be placed in the forms or on the deck until the first truck has been sampled, tested, and approved. Incorporation of materials from this truck will not be permitted unless desired slump and air content are within specified limits. Continuous placement shall not begin until after test results indicate the material meets specified requirements.

If the first load is close to a limit value, it is recommended to sample and test the second load unless site experience indicates it is not necessary.

- Initial start up test results (if taken from the truck chute) must account for method of placement. For example: If placement will be through a pump, air values should be on the high side of target to account for loss during pumping. Again, site/project experience should be factored in this decision.
- Routine acceptance testing will be at a minimum frequency of one sample per 100 m<sup>3</sup> (100 yd<sup>3</sup>). This frequency may be changed for large, continuous placement where placement rates warrant a lesser frequency. Minimum quantity placed between routine acceptance tests is 100 m<sup>3</sup> (100 yd<sup>3</sup>). This rate of testing may be increased (made more frequent) if the inspector has a concern that target values are not being met.

@

**NOTE:** Only the Materials and **Research** Division has authority to approve decreasing (less frequent) testing frequencies from those listed in *Materials Sampling Guide*. PLAN AHEAD and obtain approval for those cases where a variance would be reasonable.

- For routine acceptance testing, obtain a representative sample at the last practical point before incorporation, but prior to consolidation.

**NOTE:** When concrete is placed by means other than directly from the back of the truck the sample shall be taken after the concrete has passed through the conveyance method being used. (This includes placement by bucket, belt, pumps, power buggies, etc.)

- Routine acceptance sampling and testing does not require holding a truck until results are available. However, if there are obvious deficiencies, the inspector has the authority to hold that truck until test results are available.

- F. If there is a specific truck which is identified as causing a problem with consistency, that truck shall be rejected from further use.
- G. Transit mixers shall be completely emptied of wash water before reloading. If the truck's top fill hopper is washed after loading, no wash water shall be allowed to enter the mixer.
- H. The inspectors will need to satisfy themselves regarding compliance with the specifications for the number of drum revolutions at mixing speed.
- I. If water, air entrainment or other admixtures are added at the project site, acceptance testing will not be performed until all additions have been made AND required mixing has been completed following the change.

### **Admixtures**

Admixtures are those ingredients in concrete other than portland cement, water, and aggregates, that are added to the mixture immediately before or during mixing. Admixtures typically encountered on our jobs can be classified by function as follows:

- @ • Air entraining admixtures (optional)
- @ • Water reducing admixtures (optional)
- @ • Set retarding admixtures (required)
- @ • Set accelerating admixtures (optional)
- @ • Finely divided and permeability mineral admixtures (Fly Ash & Silica Fume) (optional)
- @ • Coloring agents (normally not used for NDR work) (optional)

The amount of any admixture used in a mix should be as recommended by the manufacturer. Effectiveness of an admixture depends upon such factors as type, brand, and amount of cement; water content; aggregate shape; gradation and proportions; mixing time; slump; and temperatures of concrete and air.

Concrete with a low air content shall not be incorporated into work. One addition of air entraining admixture is allowed at the site according to specification.

Concrete with a high air content should not be incorporated into work except under extreme circumstances. If low compressive strengths result, the concrete may be required to be removed and replaced. (*SSHC Subsection 106.05*)

### **Air Entraining Admixtures**

Air entraining admixtures are used to purposely entrain microscopic air bubbles in concrete. Air entrainment will dramatically improve the durability of concrete exposed to moisture during cycles of freezing and thawing. Entrained air greatly improves concrete's resistance to surface scaling caused by chemical deicers.



### Rules-of-Thumb

- As cement content increases, air agent must increase to maintain equal entrained air.
- As cement fineness increases, the amount of air agent must increase to maintain equal entrained air.
- As coarse aggregate size decreases, the air content increases for a given amount of air agent.
- As fine aggregate volume increases, the air content increases for a given amount of air agent.
- As mixing water increases, the air content increases for a given amount of air agent.
- Air entraining admixtures should be introduced into mix at the plant, but additional may be added at the site to adjust mix for correct air content.
- Air entraining admixtures should (usually) be added to the front of the truck at the plant. If corrosion inhibiting admixture is used, air entraining agents should be added to the back of the truck.

@

### Water Reducing Admixtures (Type A) (optional)

Water reducing admixtures are used to reduce the quantity of mixing water required to produce concrete of a certain slump or reduce the water/cement ratio. Regular water reducers reduce water content by about 5% to 10%.

Adding a water reducing admixture to a mix without reducing water content can produce a mixture with a much higher slump.

### Rules-of-Thumb

- Typically, water reducing admixtures do not reduce the rate of slump loss; in most cases, it is increased. Rapid slump loss results in reduced workability and less time to place concrete at the higher slump.
- Typically, water reducing admixtures have no effect on bleed water.
- Certain types of sulfate starved portland cements may cause false set with certain brands of water reducers. Typically, water reducers contain lignosulfonates and these sulfates are easily attracted by sulfate starved cements. This action may cause early false set.
- Despite reduction in water content, water reducing admixtures can cause a significant increase in drying shrinkage.

@ **High Range Water Reducing Admixtures (Type F) (optional)**

They are added to concrete with low-to-normal slump and water content to make high slump "flowable" concrete. Flowable concrete is a highly fluid, but workable concrete that can be placed with little or no vibration and can still be free of excessive bleeding or segregation. Flowable concrete has applications:

1. In areas of closely spaced and congested reinforcing steel.
2. In tremied concrete where "self consolidation" is desirable.
3. In pumped concrete to reduce pump pressure.
4. To produce low water/cement ratio - high strength concrete. High-range "super plasticizers" can reduce water content by about 12% to 30%.

**Rules-of-Thumb**

- The effect of most super plasticizers in increasing workability or flowable concrete is short lived. Typically, maximum is 30 to 60 minutes followed by a very rapid loss in workability.
- Typically, super plasticizers are added as split treatments (part at the plant part at the site). Sometimes the addition is totally at the site.
- Setting time may be affected depending on the brand used, dosage rate, and interaction with other admixtures.
- Excessively high slumps of 250 mm (10 inches) or more may cause segregation.
- High-slump, low water/cement super plasticized concrete has less dry-shrinkage than does high-slump high water/cement conventional concrete.
- Effectiveness of super plasticizer is increased with an increased amount of cement and/or increased fineness of cement.
- Effectiveness of water reducers on concrete is a function of their chemical composition, cement composition and fineness, cement content concrete temperature, and other admixtures being used.
- Some water reducing admixtures, such as lignosulfonates, may also entrain some air in the mix.

@ **Retarding Admixtures (required)**

Retarding admixtures (retarders) are used to delay the initial set of concrete. High temperatures of fresh concrete 30°C (8°F) and up often cause an increased rate of hardening. Since retarders do not decrease the initial temperature of concrete, other methods of counteracting the effect of temperature must be used.

### Rules-of-Thumb

- Retarders are sometimes used to delay initial set of concrete when difficult, long placement times, or unusual placement conditions exist.
- Retarders offset the set acceleration effect of hot weather.
- Retarders can be added at the site.
- In general, some reduction in strength at early ages (one to two days) accompanies the use of retarders.
- Use of retarders must be closely monitored, because there is probably no single admixture which has caused more field problems.
- If too much retarder has been used in a mix:
  1. Time will usually counter the effects.
  2. Be sure to maintain the cure during the added time.

### @ Accelerating Admixtures (optional)

Accelerating admixtures (accelerators) are used to accelerate the setting time and strength development of concrete at an early age. Strength development can also be accelerated by using:

- Type III "high-early" cement
- Lowering water/cement ratio
- Curing at controlled higher temperatures

Calcium Chloride ( $\text{CaCl}_2$ ) is the material most commonly used in accelerating admixtures. Besides accelerating strength gain, calcium chloride also causes an increase in drying shrinkage, potential reinforcement corrosion, discoloration, and potential scaling.

### Rules-of-Thumb

- Always add calcium chloride in solution form as part of the mixing water.
- Calcium chloride is not an antifreeze agent. When used in allowable amounts, it will only reduce the freezing point of concrete by a few degrees.

### Finely Divided Mineral Admixtures

These admixtures are powdered or pulverized materials added to concrete to improve or change the properties (plastic or hardened) of concrete. Based on the mineral's chemical or physical properties, they are classified as: (1) Cementitious, (2) Pozzolans, (3) Pozzolanic and Cementitious, and (4) Nominally inert. Typical PCC mix designs use pozzolanic and cementitious minerals.

- B. No beams may be set on piers until the cap concrete is 7 days old and has a compressive strength 20 MPa (3000 psi) or more.
- C. On stub abutments, steel beams and girders may be set as under A above. Concrete beams on stub abutments, same as A above. On full abutments (solid and continuous from spread footing), same as A above.

### **Use of Insulated Forms for Protection**

@ Commercial insulation may be used for protecting concrete during cold weather, or when the contract documents require controlling the heat of hydration. This technique is the contractor's option and could be used in lieu of housing and heating. The contractor **must** furnish **housing and heating and/or** insulation of sufficient quality and thickness to maintain concrete at a temperature of not less than 10°C (50°F) for the first **72** hours after placing, **and above 41°F for the next 48 hours.**

### @ **Recommend Concrete Temperatures**

@ Concrete should be between 7°C and 27°C (45°F and 80°F) when placed. To ensure a concrete temperature of at least 10°C (50°F) for **72** hours after placement the concrete for thin sections such as culvert walls, end posts, piling encasements, etc. should be 18°C (65°F) or higher, since the only additional heat source is the heat of hydration. Concrete for massive sections such as stub abutments, heavy piers, and footings should be in the 13° to 18°C (55° to 65°F) range.

Since only dry insulation is effective, any insulation that has a propensity to absorb water or become saturated must be protected with a waterproof membrane. The insulation system must provide complete coverage and be secured to provide maximum protection during the full curing period.

For typical protection applications, insulated forms must be left undisturbed for 96 hours before being removed.

### **Checking Temperature of Concrete**

For checking compliance with minimum temperature requirements during the 48-hour period after placement thermometer wells should be cast in the concrete during the pour. The following procedure for checking temperature is suggested:

1. Drill a 8 mm (5/16 inch) hole through the form at one or more locations where temperature checks will be made.
2. Grease the thermometer probe and insert it through the hole about 100 mm (4 inches) into the plastic concrete.
3. Remove probe after the concrete is set and cover hole with insulating material.
4. Further checks can be made by inserting the thermometer through the insulation into the well developed in step 2. Leave thermometer in place if desired, but protect from damage or theft.

**NOTE:** The thermometer stem should be inserted about 75 mm (3 inches) into the concrete because the sensitive portion of the stem is about 44 mm (1 ¾ inch) below the groove.

- @ Record the temperature daily for **5 days** following the pour. Temperature readings below 10°C during the first 48 hours should be entered in the Field Book and reported to the District Construction Engineer for evaluation of possible damage or price adjustment.

### **Placing Concrete**

- @ Concrete shall be proportioned, mixed and handled in accordance with the requirements of *SSHC Section 1002*. The inspector should also refer to the Materials and **Research** Manual which outlines the method of proportioning, sampling and field testing the materials necessary for the production of concrete. The contractor shall organize his/her work so that the maximum interval between batches shall not exceed 30 minutes.

Concrete should not be placed in footings, columns, etc, until all pile driving within a radius of 50 feet has been completed. If concrete pours must be made within this area prior to the completion of pile driving, such concrete shall set at least three days before further driving is permitted within this radius. Concrete shall not be placed without special permission in steel pile shells for cast-in-place concrete piles for each bent, pier, or abutment until all the shells for that bent pier or abutment have been driven (*SSHC Section 703*).

When depositing concrete in the forms, segregation must be avoided. The mass of concrete should be generally free of surface cavities resulting from the trapping of air and water along the forms. Careful spading of concrete along vertical forms and tapping of the forms will usually release the air and water bubbles. Forms which are not mortar tight will leak cement paste and result in "sand streaking." Forms should be mortar tight to the maximum extent possible. Chutes shall be of metal or metal lined and of sufficient number to preclude the necessity of shifting the chutes. If necessary, the contractor shall leave holes in the forms for the entry of the chutes or pipes. Concrete must be deposited within 2.5 m (8 ft) horizontally of the place of its final location. Concrete shall not be dropped vertically more than 1.5 m (5 feet). Concrete in walls, footings, columns, etc, shall be placed in continuous horizontal layers not more than 450 mm (18 inches) thick and vibrated to a monolithic mass. Do not allow dried concrete to collect on forms or reinforcing bars where it will fall into the work.

Currently, four test cylinders are to be fabricated for each placement (generally, each day a set of cylinders is required). These test cylinders are then tested at ages of 7, 10, 14 and 28 days.

If the 7 day cylinder tests 25 MPa (3500 psi) or above, the 10 and 14 day cylinders need not be tested and can be discarded. If the 7 day cylinder should test less than 25 MPa, the 10, 14, and 28 day cylinders must be retained and tested.

### **Consolidation of Concrete**

The contractor must establish a pattern for vibrating the concrete and ensure the pattern is followed across the entire deck.

Consolidation of concrete should be accomplished by the use of a sufficient number of vibrators of a type approved by the Project Manager. The vibrators must be of such an intensity as to visibly affect one-inch slump concrete over a radius of 450 mm (18 inches). The contractor is required to furnish a tachometer for the purpose of checking the speed of the vibrator elements.

**NOTE:**

1. No payment will be made for methods taken to keep concrete temperatures within specifications.
  2. If pour has to be delayed because of temperature, and pouring is the controlling operation, no working days will be charged.
- B. Location of permissible headers should be discussed with the contractor during the pour, it appears the temperature may exceed 30°C (86°F).

General - The wind velocity temperature relationships stated in the specifications should be enforced to avoid loss of water from the concrete surface faster than it can be replaced by normal bleeding and to avoid the resultant formation of plastic shrinkage cracks. Anemometers and thermometers must be available on site to measure wind velocity and temperature.

Concrete in bridge floors shall be placed uniformly on both sides of the centerline and shall be placed continuously between specified joints. The sequence of placing shall be in accordance with the pouring diagram shown in the plans. If no pouring diagram is shown in the plans, concrete shall be placed as directed by the Project Manager.

Wet the deck forms and approach slab grade before placing the concrete. Concrete shall be adequately vibrated to encase the lower bars of the reinforcing mat where these are near the deck form.

Special attention shall be given to finishing the riding surface on the bridge floors. Specifications Section 706.03, 710.03, and 711.03 explains concrete bridge floor finish.

It has been the policy to permit the contractor to use mechanical finishing machines of an approved type whether or not they are required by the plans or special provisions.

Method of Finish - When the hand method described in Section 704 is employed, the concrete surface shall be struck off with a strike board which conforms to the cross section shown in the plans. If this is pulled by hand, care shall be taken not to displace the reinforcing steel by the workmen doing the pulling. A small air winch anchored to a girder outside of the day's pour will pull the strike off at a slow, uniform rate, giving a truer surface with no displacement of the reinforcing steel. The strike board shall be operated with a combined longitudinal and transverse motion, always carrying a small roll of concrete in front of the cutting edge. The strike off shall be pulled a sufficient number of times to properly distribute the concrete. A longitudinal float generally is required and is described in *SSHC Section 704*. The longitudinal float shall be lapped 1/2 its length when moved to a new position and shall be operated across the surface a sufficient number of times to produce a uniform, smooth riding surface. Occasionally during the finishing operation, conditions may require the use of the long-handled transverse float, which require extreme care in its use to preserve the desired cross-section and a smooth riding surface.

@ Regardless of whether hand or machine finishing methods are used, the floor surface shall be tested for trueness with a straightedge 3 m (10 foot). The bridge contractor is required to furnish a 3 m master straightedge for use in trueing and checking the working straightedges.

8. Start casting the deck in the evening – waiting until the outside air temperature begins to drop.
9. Check the outside air temperature during casting. It should be less than 86°F.
10. If the evaporation rate during casting exceeds .15 lbs/sf/hr, then fogging as prescribed in the Nebraska Fogging Special Provision will replace the evaporating water, keep the deck cool, and slow the setting time.

@

#### Seal Bridge Deck Cracks

1. Bridge deck cracks should be sealed before de-icing salt is ever applied on or near the deck.
2. High molecular weight methacrylate is the best sealant and is squeegeed into cracks.

#### Cold Weather Placement

On account of the high incidence of shrinkage cracks due to artificial heat during the protection period, no bridge floors will be constructed during cold weather except with the special written permission of the Construction Division.

#### Floor Drains

Check floor drain locations against floor grades to be sure deck surface will drain. Adjustments of drain height may be advantageous on every flat grade surface. Also, at this time, study the discharge area from the floor drain for potential damage to features under the structure such as shoulders, railroads, or berm slopes. Major problems foreseen should be brought to the attention of the Construction Division.

#### Installation of Joints (*SSHC Subsection 704.03*)

#### Reinforcement

Reinforcement must be accurately placed and rigidly fastened. If cages are not rigid and braced diagonally in both transverse and longitudinal directions, problems can occur. The remedy:

- Recommended Procedure:

Epoxy coated smooth bar, about 6 mm (1/4 inch) in diameter can be placed diagonally from the top of a leading cage to the bottom of the second trailing cage. (Description is referenced to direction of paver's travel.)

### Simultaneous Casting of Deck and Approach Slabs

@

Casting the approach slabs and the deck simultaneously creates a smoother transition and ride. However, to avoid maintenance and to preserve the integrity of the deck and the approach slabs, a metal bond breaker should be placed over the abutment across the entire width and depth of the deck. This will ensure that a random crack does not occur before the joint can be cut. **At the grade beam, the joint is usually blocked out with styrofoam.**

@

The rail that the finishing machine rides on must be uniformly rigid. Unfortunately, where the rail passes over the grade beam and abutment, the rail is frequently more rigid than either side of these substructures. This can cause a dip either side of the abutment and the grade beam, which can result in a “bump” over the abutment, and grade beam.

Another problem can result when the deck overhangs the outside girder. Typically, the deck forms are supported by outrigger jacks braced against the outside girder. The weight of the concrete and the finishing machine can momentarily bend the outside girder as the placing operation progresses. Temporary construction braces (usually wood blocks) between all girders can prevent girder movement.

### Surface Checking (Not in Spec)

A 3 m (10 ft) straightedge surface check shall be conducted on all bridges and deck overlays not covered by the Smoothness Specification. Surface areas inaccessible to profilometer shall also be checked.

On some projects only one wheel path may be included in the placement width. For price adjustment or incentive pay, only the portion within the traveled lane shall apply. Variable width sections for on and off ramps, which are outside the through traveled lane, will be checked with the surface checker.

### Test Procedure for Smoothness

@

A Special Provision entitled “Bridge Deck and Approach Slab Smoothness” will usually be included in the contract proposal. This Provision deals with the method of testing for smoothness and the method for correcting surfaces outside of the smoothness limits. The contractor is responsible for scheduling the testing, which will be performed by Materials and **Research** Division personnel. The contractor must give the Project Manager seven days notice prior to the date he requests that testing be done. The Project Manager shall contact the Materials and **Research** Division and arrange for testing on the requested date.

### Evaluation

@

Materials and **Research** Division will furnish a profile index to the contractor within 72 hours of the completion of the tests.



### Surface Correction

Corrective work shall be done in the presence of the Engineer with a diamond bladed grinder at least one meter wide. Grinding residue must be controlled. After the deck is ground, a second test will be made to determine if the deck now meets the smoothness requirements. This second test will also be performed by Materials and Research personnel and it is anticipated they will be on-site at the time of grinding, in order that they may perform the retest while the grinding equipment is on-site.

@

### Acceptance

Materials and Research personnel will notify the Project Manager whether or not the corrective work has resulted in an acceptable deck surface. If grinding cannot correct the surface profile, the Specification requires removal and an overlay with high-density low slump concrete.

@

## **708.00**      **HAND RAILS** (*SSHC Section 716*)

### **708.01**      **DESCRIPTION**

This work shall consist of furnishing and erecting all steel or ornamental handrail and all miscellaneous hardware such as anchor bolts, capacity plates, and splices.

## 708.02 MATERIAL REQUIREMENTS

Handrails shall conform to the horizontal and vertical curves specified in the plans. Posts shall be set normal to the top of the curb, except when otherwise noted in the plans or special provisions.

## 708.03 CONSTRUCTION METHODS

### Ornamental Handrail

Care must be taken in storing, handling, and erecting ornamental handrail so as not to permanently mar or injure the finish on the post and rail elements. Aluminum ornamental handrail which is to be stored in the open should be removed from the cardboard cartons since cartons may stain the handrail when they become wet and considerable effort is required to remove these stains.

Ornamental handrail inspection is not generally waived at the fabrication plant even if small quantities are involved. If the Project Manager does not have a copy of a shop inspection report on file indicating inspected material, the material should be inspected by Materials and **Research** Division. If there is a question of whether the material has been inspected or not, the Materials and **Research** Division should be contacted for clarification.

@

The Project Manager should make a visual check of the handrail before placing it in the structure. In the case of aluminum tubing, "carbon streaks" that develop in the manufacturing process are not cause for rejection. However, the carbon streaks should be limited to one 90-degree segment of the surface of any rail. Particular attention is necessary at the time of erection. Tubing should be placed in the bridge railing in such a manner that the carbon streaks are not visible to traffic.

- County bridges usually only get one coat.
- New state structures usually get two coats.
- Repainting an existing structure usually means adding a third coat.

The Project Manager or inspector should check the dry film thickness of the shop and field coats of paint applied on structural steel in accordance with the following instructions:

Shop Coat - The shop coat of paint may or may not have been checked in the fabricator's shop; nevertheless the shop coat should always be checked in the field, and any deficiency in paint film thickness corrected, before the second coat is started. When the dry film thickness of the shop coat is found to be inadequate, the Materials and Research Engineer should be notified in order that the particular fabricator involved may be made aware of the situation.

Second and Third Coats - Checking the thickness of the second and third coat with the magnetic gauge is accomplished by measuring the cumulative thickness of the first (or shop coat) and the additional coats. The dry film thickness of the second coat should always be checked and any deficiency in paint film thickness corrected before the third coat is started. Any deficiency in paint film thickness must be corrected before the work can be considered complete and consideration of acceptance given.

The equipment used to check the dry film paint thickness is called a magnetic dry film thickness gauge. One or two of these gauges are being furnished to each District Office for use in the District in checking the painting of steel structures. These gauges are expensive, delicate instruments and must be carefully handled and always kept in the carrying case when not in use. The procedure for using the gauge is as follows:

1. Turn dial to maximum reading.
2. Place pole on the surface to be measured.
3. Be sure the magnetic contact is touching the painted surface.
4. Slowly and as continuously as possible, rotate the dial clockwise until magnetic contact breaks. A click will be heard when the pin breaks contact. At this point the coating thickness can be read on the dial indicator. The reading will remain on the dial when the gauge is removed from the surface being checked. The gauge can also be held in any position to take a reading. The magnetic gauge reads directly in mils. A reading of 2 on the dial indicates that the thickness of the paint film is 2 mils or .002 inch.

The frequency of testing for paint thickness should be as follows:

1. Girders - Each line of girders should be checked at a maximum interval of 15 m (200 ft) and at each check point, 3 or 4 tests should be made. For example, on a 60 m (50 ft) bridge each line of girders should be checked at the abutments and at 3 intermediate points. At each one of these points three or four places should be checked such as a point on the web, a point on each flange, and a point on a stiffener.

@ **710.00 CULVERTS** (*SSHC Sections 717 to 726*)

**710.01 GENERAL**

The backfill near a pipe or box culvert is more expensive than excavation in the surrounding area. Therefore, in the *SSHC Subsection 702.03*, limits are placed on the quantities "Excavation for Box Culvert" and "Excavation for Pipe, Pipe-Arch Culverts, and Headwalls."

@ **710.03 CONCRETE BOX CULVERTS** (*SSHC Section 717*)

@ **710.10 DESCRIPTION**

A culvert may be defined as a structure to convey water under a roadway. Concrete box or arch culverts are used when drainage areas are too large for the conventional culvert pipe or when cattle passes under the roadway are desired. These structures are cast-in-place according to standard or special plans under *SSHC Sections 702, 704, 705 and 717*.

@ The contractor may request that culverts be built to the nearest whole English units. Any material savings will be deducted from the payments due the contractor.

@ **710.11 MATERIAL REQUIREMENTS**

@ See Section 706.02. Note in SiteManager the date the reinforcing steel is verified on-site.

@ **710.12 CONSTRUCTION METHODS**

General - The concrete placement for box and arch culverts is discussed in Section 706 of this manual. *SSHC Subsection 717.04* further provides that foundation excavations shall be "as dry as practicable before concrete is poured". This requirement recognizes the necessity of an adequate foundation for roadway structures. When the excavation for a footing is completed, the project manager or his/her representative should be contacted for his/her approval of the footing subgrade before any concrete is placed. In the event that unsuitable foundation subgrades are encountered, suitable ones composed of concrete aggregates or a concrete seal course must be constructed (see Subsections 702 and 702 of this manual).

Construction of curtain walls on culvert footings usually is quite a problem because of the difficulty in maintaining the excavation in proper condition while placing concrete.

If material to be excavated is of such nature that neat lines for the curtain wall cannot be maintained, the Project Manager may allow forming and placing the curtain wall to the bottom of the footing. Mud must be prevented from working up into the concrete.

@ Currently, the plans for box culverts show the backside of the wing battered 3/8" in 12", which results in a varying wall thickness. Contractors may be permitted to construct walls using the wall's base thickness, thus eliminating the batter. A plan revision or change order will not be required to effect this change.

@ (A portion below was moved from Page 418)

**Placing Concrete and Form Removal**

**Placing Concrete**

Placing Concrete in Walls and Top Slab. *SSHC Subsection 704.03* states that culvert, sidewalls, and top of slab may be constructed as:

- A monolith unit or,
- Concrete in sidewalls may be placed and allowed to harden before the top slab is placed.

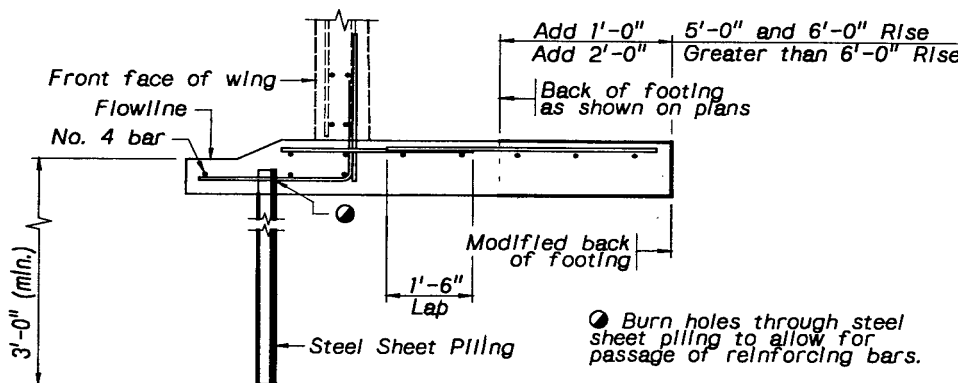
If the contractor chooses to use the hardened concrete method, keyways will have to be installed to anchor the cover slab.

@ **Option to Use Steel Sheet Piling in Lieu of the Planned Turndowns at Box Culvert Ends**

The Box Culvert plans show a 3'-0" concrete turndown at the end of the culvert barrel and along the wing wall footings. The culvert contractor may request the option of using steel sheet pile instead of this turndown. If steel sheet pile are to be used, the Bridge Division has requested that the steel sheet pile turndown depth remain at 3'-0". Also, the dimension between the inside face of wing and outside edge of wing footing (including the taper), must be increased (at the same footing thickness) by an additional 1'-0" for rises of 5'-0" and 6'-0", and, and 2'-0" for rises greater than 6'-0". No additional concrete or reinforcing steel is required for the portion of the turndown at the end of the culvert barrel. In the wings, this option shall include the extension of the traverse reinforcing steel, placement of additional longitudinal reinforcing (same spacing at the No. 4 bars in the top of the footing), and the concrete shall be poured monolithically with the rest of the wing footing. The concrete and reinforcing steel used shall be the same as that used in the rest of the structure. All additional concrete, reinforcing steel, preparation, equipment, tools, labor and incidentals necessary to complete the work shall be supplied at no additional cost to the Department.

All steel sheet piling shall conform to ASTM A-857 or A-525 grade 33 and 36 and shall meet the following minimum requirements:

Section Length	18 inches
Max. Section Depth	3 ½ inches
Min. Section Thickness	7 gage
Section Modulus	2.8 in <sup>3</sup> /foot



**OPTIONAL STEEL SHEET PILING TURNDOWN**  
(For concrete box culvert wings)

@ (This text was moved from 418a to this page)

### Removal of Wall Forms

On large culvert jobs, it is a distinct advantage for the contractor to remove wall forms before the top slab has attained sufficient age to remove supporting forms. This will be permitted under the following conditions:

- Vertical forms may be removed as provided in *SSHC Subsection 704.03*.
- Slab forms must be supported independently of the wall forms.
- Vertical supports for the slab forms must be capped with timbers. Longitudinal spacing of supports with 100 x 150 mm (4x6 inch) caps on edge should not exceed 1.4 m (4.5 ft). With 100 x 200 mm (4x8 inch) caps, spacing should not exceed 1.8 m (6 ft). Rows of supports must not be over 1.2 m (4 ft) apart. There must be at least two rows of support, with the outside rows not more than 0.6 m (2 ft) from walls. Variance from the above suggested spacing should be reviewed by the Project Manager.
- Vertical posts shall not be smaller than 100 x 100 mm (4x4 inches), but may be built up of two 50 x 100 mm (2x4 inches) pieces of lumber. Lateral bracing will be required. A vertical clearance of 6 mm (1/4 inch) must be provided between the wall form studs and the slab form joists.

**NOTE:** Lumber may be sized in metrics using actual, not the conventional nominal sizes.

- The slab form must remain in place as provided in *SSHC Subsection 704.03*.
- The interior walls of the culvert must be coated with white pigmented curing compound as provided in *SSHC Subsection 704.03*.

### Flume Reinforcement

Regarding Type I, II, IV, and V Flumes, welded wire fabric reinforcing is now required on the Special Plan C (4341, 4342, 4344, 4345 -- both E & M) for the flume and spillway areas. This wire can be awkward to place and keep in position. Contractors may place **intersecting No. 3 rebar at 12" centers** as an alternative to the welded wire fabric.

**712.00      CORRUGATED METAL PIPE CULVERTS (SSHC Section 719)**

**712.01      DESCRIPTION**

This work shall consist of furnishing and installing new corrugated galvanized metal pipes and pipe arches and the relaying of existing corrugated metal pipe and pipe arches.

**712.02      MATERIAL REQUIREMENTS**

@ SSHC Tables 1035.01 & 1036.01 contain the required minimum gage or sheet thickness for the various pipe diameters. The "Materials and Sampling Guide" provides that the necessary tests for acceptance will be handled by the Materials and **Research** Division. Material samples need not be taken by project personnel unless a special request is made for samples. The diameter of the pipe and number of sections of pipe covered by each heat number and delivered to each culvert location should be recorded in the culvert notebook. The pipe shipment should be checked against the shipment report and any discrepancy should be reported to the Project Manager. The pipe shipment should also be checked for shipping damage and any damage noted should also be reported to the Project Manager.

**Ordering Material**

**The contractor is not permitted to order or deliver corrugated metal pipe or pipe arches until a "culvert list" listing the correct sizes and lengths of pipe is furnished to him/her by the Project Manager.** Subsection 105.07 of this manual for detailed instructions on the field checking of culverts and the preparation and submission of the culvert list.

**712.03      CONSTRUCTION METHODS**

**Excavating and Backfilling**

Refer to Section 702 of this manual.

**Installation**

The culvert inspector should insist on careful handling of the corrugated metal pipes or pipe arches. Corrugated metal pipes or pipe arches should be lifted and moved with a rope sling or similar device which will not damage the galvanized surfaces of the pipes or pipe arches. The contractor should not be allowed to drag the pipes or pipe arches over abrasive surfaces as this will also damage the galvanized surfaces.

Corrugated metal pipes and pipe arches shall be laid with the inside circumferential laps lapped downstream so that the water will flow over the lap. The pipe shall be rotated so that the longitudinal laps are horizontal. When joining sections of pipe, the connecting bands should be pulled up as tight as possible. The band should be tapped with a wooden mallet as the bolts are tightened. Excessive pressure on the bolts should be avoided to keep from pulling the steel angle loose from the band. A gap of about 25mm (1 inch) should be allowed between the pipe ends being joined, to allow the corrugations on the pipe and band to match. Corrugated metal pipe is not generally used for irrigation structures.

@

**Temporary Culvert Pipe**

The Districts will be responsible for making a determination (presumably during the plan-in-hand inspection) regarding whether or not to ask for new pipe.

Logistics Division maintains a list of pipe values which can be used to determine damages to the Department when pipe is not returned to us in usable condition.



### **Contract Administration**

Both the Project Manager and the inspector should review the construction period shown on the proposal form.

From March 1 to June 30 and from August 1 to freeze-up, working days should be charged whenever it is possible to perform a seeding contract controlling operation.

@

### **Erosion Control**

Normal grading operations require the following erosion control:

- Install “Silt Fence” before grading begins.
  - “Temporary Silt Checks” must be installed as soon as rough grading establishes ditches. The Contractor should also construct earth-berm dikes, dams, sediment basins, temporary slope drains and other erosion control features as shown in the plans or as necessary to control erosion and siltation.
  - When final grading begins “Temporary Silt Checks” need to be removed.
  - When final grading is complete, the area should be cover crop seeded and TSC’s reinstalled.
  - As soon as possible after final grading and pavement is complete, permanent erosion checks should be installed and the area should be permanently seeded.
- \*\* If permanent erosion checks are available and installed immediately after final grading, the TSC do not need to be reinstalled.

- d. Inspection tip for mulch  
  
Establish a 1 hectare (2 ½ acre) or small 0.4 hectare (1 acre) plot for mulch. Mulch and crimp this area and use it for a reference
- e. Send in the project seeding record to Roadside Development upon completion of seeding
- f. Please remind the seeding contractors to do a good job of cleaning out the seeding drills when changing from Type "A" to Type "B". Type "A" has taller grasses than we want on our shoulder areas.
- g. Changing from Type "B" to Type "A" does not require a clean out.

### **803.02 PERMANENT SEEDING DATES**

The normal periods for permanent seeding are from March 1 to June 30 and from August 1 to December 31 or freeze up. These dates may be modified by the Special Provisions.

### **803.03 PREPARATION OF SEED BED**

Before seeding operations commence, care should be taken to properly prepare the area to be seeded. Areas around culvert headwalls and wingwalls, shoulders, flumes, sign posts, guardrail, and other structures require special attention. The seed bed shall be worked to a depth of at least 50 mm (2 inches) deep.

### **803.04 SEED**

The seed is mixed at the seed company and overseen by Roadside Development.

The following items should be noted when inspecting hydroseeding:

A fanning motion or horizontal motion of the seeding nozzle insures uniform application of the seed. Do not use an up and down motion; it results in seed application too heavy near the seeder and too thin at the far reach of the spray.

The seeder tank must be cleaned when changing seed mixtures.

@

The seed measurements should be discussed at the preconstruction conference and a date established as to when they would be provided to the contractor. The Department normally will buy any excess seed. Pay for what we want and get.

**808.00 EROSION CHECKS**

**808.01 EROSION CHECKS CHECKLIST**

SSHC Reference: Section 808 -- Erosion Checks & Special Provisions

Other References: Approved Products List

Inspection Crew: Construction Technician

Inspection Equipment: NA

@

- General Comments:
1. Work generally performed in conjunction with erosion control **after an area is final graded.**
  2. Make sure that the center bale is lower than the outside bales
  3. The erosion control material for the erosion checks must match the erosion control material used in the ditch. Is the material on the approved products list?
  4. Work performed similar to erosion control
  5. Seed is never to be placed under the filter fabric - only on top of the filter fabric
  6. Some erosion control materials have the filter fabric attached. When this occurs, the seed is directly seeded onto the erosion control material and then soil is spread over the seed
  7.
    - a. **“Temporary Silt Checks” (TSC) are to be installed as soon as rough grading begins. TSC should be placed as shown in the plans or as directed by the engineer.**
    - b. **Temporary Silt Checks (TSC) have to be removed in order for final grading to be completed. However, once final grading is complete, the TSC’s need to be reinstalled.**
    - c. **The contractor does not have to reinstall TSC if instead the permanent erosion checks are available and will be installed immediately after finish grading.**
  8. Roadside Development (402) 479-4537 Questions -- call 402-479-4537, Roadside Development

@

**808.02 PLACEMENT**

The suggested sequence of work for special ditch control is as follows:

**Shape**

Shape the ditch and prepare the seed bed approximately 20 mm (3/4 inch) deep. If ditches are unstable and equipment leaves them in a rough condition, the seed bed must be prepared by hand. The ditches should be shaped so that the ditch drains without water ponding and has a minimum depth of 150 mm (6 inches). Minor irregularities in ditch alignment must be corrected so the completed ditch will follow the ditch line constructed during the grading operation. This may not be possible in cases of severe washing of the ditch bottom. All rocks and clods more than 40 mm (1 ½ inch) in diameter, and all sticks and other materials, which prevent contact of the special ditch control materials with the seed bed, shall be removed.



- e. Quantities and summary of quantities.
6. Usually guard rail contract work cannot be started until other contract work on the project is completed. Therefore, the Project Manager must keep the district office, the contractor and the construction office informed as to the date the work site will become available.

#### GENERAL INSTRUCTIONS

Safety implications make it very important that the Project Manager, inspector, and contractor know the plans, Specifications 902 and 903, and standard road plans that apply to this work.

A guardrail inspection checklist is provided at the beginning of this Division. This checklist may be helpful in preparation and inspection for guardrail work. Inspection and material acceptance requirements are identified in the Plans and Specifications.

Guardrail installations are dependent on correct location of shoulder or bridge approach paving and 10:1 (or flatter) approach slope to guardrail. Prior to the start of guardrail installations, these need to be reviewed and verified.

Specific attention should be given to location of curb and intake in the area of paved shoulders. The Standard and Special Road Plans identifies length of shoulder paving and curb for bridge approaches, guardrail installation line and offsets which define the location of back of curb from face of rail, guardrail post locations and flume for bridge end drains.

Slope on finished surface between shoulder edge and a point at least 600 mm (2 ft) behind back of posts should be 10:1 or flatter. This provides a slope which will keep vehicle wheels in contact with the ground and adequate soil support for the posts.

If the inspector or the Project Manager observe a variance from plans or specifications, then the contractor should be advised immediately. When situations arise that are not covered by specifications, plans, standard road plans, or this instruction, contact the Construction Division.

#### 903.02 MATERIAL REQUIREMENTS

@ The plans, special provisions and specifications will include the material requirements. The Materials and Research Manual includes the inspection and test requirements for the materials. The field personnel must insure that all materials used in the work conform to these requirements.

#### 903.03 CONSTRUCTION METHODS

Standard plan 904, Traffic Control Devices for Construction and Maintenance, is a part of all guardrail project plans. Field personnel shall insure that project traffic (whether local only or traffic maintained condition are in effect) is controlled and workmen protected so this work is performed under safe conditions for all involved. Generally, guardrail work would be considered to require traffic control procedures similar to the situation sketches for minor maintenance of short duration or road repair shown on standard plan 702-R5 for cable guardrail.

All bolts on bridge end connections shall be high strength, galvanized hex bolts. Surface of bolt head should be marked A-325, A449 or have three radial marks at 120° intervals.

**GUARDRAIL POST**

@

Beam guardrail posts – wood **and** steel – must be able to rotate if the beam rail is to work properly. Care must be taken to insure compliance with the details shown on the plans regarding "space" behind the posts.

**ET-2000 PLUS**

Contractors may substitute the new ET-2000 head (ET-2000 Plus) for the old head at no additional cost to the Department. In fact, we prefer it. Standard plans are being updated.

**903.04 METHOD OF MEASUREMENT**

Final field measurement will not be required when the guardrail is constructed as ordered.

## DIVISION 1000

### MATERIAL DETAILS

#### 1001.00 GENERAL

*Specification Division 1000* provides detailed descriptions of the materials specified for highway construction. (Refer to the *Standard Specification for Highway Construction Manual Division 100* for further material information.)

#### 1001.01 MATERIAL CERTIFICATIONS

Construction materials may required certificates of compliance, certified tests, or reports of inspection from an outside agency for their use and acceptance. These materials will not be incorporated into the work until such information has been received by State Personnel.

After the material information has been received, the following course of action will be taken:

- A. The information will be reviewed by State Personnel to insure that it conforms with the material requirements.
- B. The information will be dated when it is received from the contractor. This can either be initialed and dated or date stamped.
- C. The original copy of the information will be forwarded to the Materials & Research Division immediately. A copy will be kept in the Project Manager's project file.

@

Material inadvertently incorporated in the work without the required material documentation should not be included for payment on the progress estimate. If an item is on the estimate, it should be removed until proper documentation is received.

#### 1001.02 MATERIAL CERTIFICATION RECEIPT & INTEREST DATE DETERMINATION

The interest beginning date is normally the sixty first day following tentative acceptance.

If the certifications are not received in a timely manner, then the interest date will be adjusted to the date that the documentation is in NDR possession. This is why it is extremely important to date the information when it is received from the contractor.

**1002.00 APPROVED PRODUCTS LIST**

**1002.01 DESCRIPTION**

Many material items are not described in detail in the plans and specifications but are authorized for use as shown on the NDR Approved Products List. The NDR Approved Products List is on file on the **NDOR web page** and is updated when a new **product** is added to the list or when a product is dropped from the list.

@

**1002.02 ACCESS COMMANDS**

*Moved following paragraph from page 479 and deleted text.*

@

Contact Terry Masters in the NDR Materials and **Research** Division at (402) 479-4754 if there are any questions concerning the viewing or printing of the Approved Products List.

@



@ *Deleted text from this page.*

**1002.03      ADDITIONS/DELETIONS TO THE APPROVED PRODUCTS LIST**

The Approved Products List is normally updated on Friday. Materials that meet NDR's *Standard Specifications for Highway Construction* may be added to the list at any time. Materials may also be deleted from the list at any time.

@ Contact the Physical Testing Section in the NDR Materials and **Research** Division at (402) 479-4746 to obtain information on required certification and documentation that is necessary for a specific product.

*SSHC Subsection 1001.03* identifies details relating to the use of the Approved Products List and the procedure for using a material that is not included on the Approved Products List.

**1003.00 WHITE PIGMENTED CURING COMPOUND AND HOT-POUR JOINT SEALER**

**1003.01 DESCRIPTION**

White pigmented curing compound and hot-pour joint sealer are sampled at the manufacturer's plant and tested in the Lincoln laboratory before being shipped to Nebraska. Test results for curing compound and joint sealer are on file on the mainframe computer. When either of these materials arrive at the construction site, it is necessary to identify the manufacturer and lot number of the material, then check the mainframe computer file to verify that the material has been tested and approved for use on the project. The possibility always exists that untested material may be shipped to the construction site.

**1003.02 ACCESS COMMANDS**

The test results for white pigmented curing compound and hot-pour joint sealer can be accessed from any mainframe terminal. After logging on and getting the "Ready" prompt, type YCCHP and then press the enter key. This will bring up a screen with the following heading:

State of Nebraska  
Department of Roads  
Concrete Curing Compounds and Hot Pour Joint Sealers

Below the heading, one of the following three options can be selected:

1. Curing Compound
2. Hot Pour Joint Sealer
3. Approved Products List

For "Select Material", type "1" or "2", depending on the material being checked.

For "Select Manufacturer", type the code (C1, C2, H1, etc.) for the name of the manufacturer of the material being checked. Then press the PF8 key (Query Test Results).

The next screen will show a blank test report form. Enter the "Lot Number" of the material being checked and press enter.

The next screen will show the test results of the material and a notation under the "Remarks" section indicating that the material passed.

The PF keys can then be used to query additional lots, print the report, return to the main menu, or exit the "YCCHP" program.

@ Contact Terry Masters in the NDR Materials and **Research** Division at (402) 479-4754 if there are any questions concerning the viewing of the curing compound or joint sealer files.

@

If a test report is not available for the material being checked, contact the Engineer of PCC and Tests in the NDR Materials and **Research** Division at (402) 479-4756 to check on the status on the material in question.

### 1003.03 REPORTING MATERIAL USAGE

@

The quantity of white pigmented curing compound and/or hot-pour joint sealer used on a project is to be reported by project personnel using the "Create Usage Report" in the "YCCHP" program. . (These reports are also available on the [Department web page as approved lots.](#))

At the main menu of the "YCCHP" program, after "Select Material" and "Select Manufacturer" have been entered, press the PF9 key (Create Usage Report).

The next screen will show the usage report. The following information is to be completed:

- Lot Number
- Control Number
- Project Number
- Project Location
- Quantity Used (gallons of curing compound or pounds of joint sealer)
- Report By

For information purposes, the quantity of material used on a project can be determined by pressing the PF10 key (Query Usage by Control Number) from the main menu of the "YCCHP" program. After pressing the PF10 key, the next screen will show a blank usage report. Enter the Control Number for the project to determine the quantity of curing compound and/or joint sealer used on the project.

### 1003.04 CEMENT CERTIFICATIONS

@

Note 7 in the Materials Sampling Guide, Volume II, requires that the pink copy of the cement certificate of compliance, DR Form 228 or a copy of the mill's own certification form be mailed to the Materials & **Research** Division. However, Materials & **Research** does not need the pink copy of the certification mailed to them anymore. The copy at the concrete production facility is enough for Materials & **Research** records.

The certificate of compliance is needed both for mills that require sampling and those that do not. When a sample is required, normal procedure has been to submit the pink copy with the sample. This is acceptable. For those mills which do not require sampling, please collect and submit the certifications on a routine basis but at a minimum of once each week.

**1003.05 CONCRETE STRENGTH**

@

The following English and Metric unit “Concrete Strength Variation” table is provided to define the different strengths that may be specified. The specified strength has varied as the Department has converted from English to Metric units and then back to English units. In the following table, the standard strengths are given in pounds per square inch (psi) and the various equivalent units that have been used in the past 5 years to specify this strength are shown. **However, the strength that a contractor is held-to can only be what is contained in the contract. So if the contract calls for 2900-psi, we cannot reject or deduct if he does not provide 3000-psi.**

**Concrete Strength Variation**

<b>Current Standard Strength (psi)</b>	<b>Actual Specified Strength (psi)</b>	<b>Actual Specified Strength (Mpa)</b>
3000	3000, 2900	20, 20.7, 21
3500	3500, 3625	25, 24.3, 24
4000	4000, 4350	30, 27.6, 27

**1200.03      SITEMANAGER SUPPORT LIST**

@      *(This page now becomes page 528, not 528a)*

<b>System Administration</b>		
------------------------------	--	--

Lee Burbach	Information Systems	(402) 479-3982
Shirley Daugherty	Construction Division	(402) 479-4559
Jim Ferguson	Construction Division	(402) 479-4454
Mitch Hendricks	Information Systems	(402) 479-3616
Bill Hitzeman	Construction Division	(402) 479-4456

<b>District Trainers</b>		
--------------------------	--	--

@ <b>Jeff Kisicki</b>	District 1	(402) 471-0850, Ext. <b>1910</b>
Jodie Domenge	District 2	(402) 595-2534, Ext. 223
Bill Mainquist	District 3	(402) 370-3470
Terry O'Neel	District 4	(308) 385-6265
Scott Clinger	District 5	(308) 262-1920
Russ Frickey	District 5	(308) 262-1920
Ronda Lewis	District 6	(308) 535-8031
Kelly Doyle	District 7	(308) 345-8490
Linda Jackson	District 8	(402) 376-1126
@      Rhonda DeButts	Materials & <b>Research</b>	(402) 479-4760

<b>Resident Trainers</b>		
--------------------------	--	--

@      Craig Washburn	District 1	(402) 471-0850, Ext. 1138
Jeff Kisicki	District 1	(402) 471-0850, Ext. 1910
Bill Jasa	District 1	(402) 335-4131
Russ Eltiste	District 1	(402) 335-4131
Mel Kuper	District 1	(402) 729-3489
Bob McClure	District 1	(402) 729-3489
Karl Burns	District 2	(402) 595-2534, Ext. 269
Micky Jacobs	District 2	(402) 727-3292
Gary Mangen	District 2	(402) 595-2534, Ext. 268
Mark Kai	District 3	(402) 375-7071
Lynette Norman	District 3	(402) 370-3474
Lisa Sudbeck	District 3	(402) 254-6552
Lowell Napier	District 3	(402) 564-5751
Lyle Kohmetscher	District 4	(402) 462-4996
W. T. Farber	District 4	(308) 462-1996
Richard Kwiatkowski	District 4	(308) 754-5411
Tom Anderson	District 4	(402) 362-5934
Arlen Zaruba	District 4	(308) 728-5655
Scott Griepenstroh	District 4	(308) 385-6265
Calvin Splattstoesser	District 4	(308) 385-6265

Resident Trainers		
-------------------	--	--

Duane Katen	District 5	(308) 432-6144
Tony Armer	District 5	(308) 262-1920
Darryl Steinwart	District 5	(308) 632-1429
Kerri Lewandowski	District 6	(308) 535-8031
Bill Teahon	District 6	(308) 872-6733
Duane Collins	District 7	(308) 345-8490
Gene Colfack	District 8	(402) 336-2051
Mike Freeman	District 8	(402) 387-2471
Dean DeButts	Materials & Research	(402) 479-4809
Chris Dowding	Materials & Research	(402) 479-4753

@

*(This page now becomes page 528a, not 528b)*

## DIVISION 1300 -- PROJECT SURVEYS

### 1300.01

### GENERAL

*SSHC Section 114*, Construction Surveying, requires that certain vertical and horizontal control stakes be set for the various items of work to be constructed. This is interpreted to mean the Department will provide the contractor with sufficient intermediate grade and alignment points or stakes, so the contractor can construct the work according to contract documents.

When grade and alignment stakes, including intermediate points, are set by an NDR survey crew, the Department will be responsible for correctness of staking. The contractor shall be responsible for the correct transposing of data from the construction stakes to the work.

Refer to NDR construction surveying handbook for instructions on construction staking for the various types of work.

@

The required accuracy for our plans and surveys are as shown below:

<b>Survey/Plan Accuracy</b>		
<b>Description</b>	<b>Metric (m)</b>	<b>English (ft.)</b>
Alignment (Project) PI's, PT's, etc. and CP's/BM's	0.001	0.01
Farmstead Drives	0.1	1
Field Entrances	0.1	1
County Roads	0.01	0.1
Intersecting Highways	0.001	0.01
Telephone Poles/Power Poles (offset)	0.1	1
Drainage Pipes (Stationing)	0.1	1
Length of Pipe	0.1	1
Box Culverts (Stationing)	0.1	1
Length of Pipe	0.01	0.1
Bridges (Stationing)	0.001	0.01
Wells (Stationing/offset)	0.1	1

@ **This section was moved from Page 531.**

## 1300.02 CONSTRUCTION STAKES AND SURVEYS

### General - Construction Staking

Construction surveying represents a large proportion of the construction engineering cost and, therefore, requires study to eliminate all needless refinements. The goal to be reached is a satisfactory project constructed according to the approved plans with a minimum of cost. Centerlines, right-of-way monuments and benchmarks should be established within recognized limits. Other stakes should be established to standards commensurate with their use.

- Rt or Lt is relative to stationing – align yourself looking up to next higher station number to determine left or right.
- @ • **The project manager needs to communicate with the contractor to determine where the contractor plans to start work. With good communication, the Project Manager should be able to anticipate the contractor's need for stakes.**
- @ • Then have survey crew set the construction stakes as far ahead of the contractor as possible. The Project Manager must have the area staked sufficiently in advance to avoid construction delays.
- The stakes provide the contractor the construction lines and grades and also serve as an inspection guide.
- Stakes must be accurate.
- @ • Keep communication with the contractor open so if a change is necessary, staking will not delay the project.



## APPENDIX 1 - NDR FORMS

### GENERAL ADMINISTRATION FORMS

DR 124	Shop Work Order .....	1 - 5
DR 146	Stock Requisition .....	1 - 6
DR 147a	Stock Returned For Credit.....	1 - 7
DR 151	Purchase Order.....	1 - 8
DR 159	Allowable Equipment Inventory Missing (Lost or Stolen) Damage Report ..	1 - 9
DR 329	Imprest Inventory Adjustment.....	1 - 10
DR 332	Furniture and Equipment Issue/Transfer Document .....	1 - 11

### CONTRACT ADMINISTRATION FORMS

DR 16	Contract Time Extension Document .....	1 - 13
DR 42	Field Approval of Subcontract Work .....	1 - 14
DR 44	Summary and Distribution of Costs .....	1 - 15
DR 58	Force Account Agreement.....	1 - 16
@ DR 74	Cost Overrun/Underrun Notification.....	1 - 16a
DR 84	Record of Contractor Payrolls Received.....	1 - 17
@ <del>DR 87</del>	<del>Safety Inspection Checklist .....</del>	<del>1 - 18</del>
DR 90	Flagger Certification .....	1 - 20
DR 91	Notification of Project Completion.....	1 - 21
DR 96	Inspectors Working Day Report.....	1 - 22
DR 98	Report of Labor Compliance Inquiries .....	1 - 24
DR 188	Work Order .....	1 - 25
@ <del>DR 203</del>	<del>DBE Performance Record.....</del>	<del>1 - 26</del>
DR 204	Weekly Force Account Statement .....	1 - 27
@ <del>DR 289</del> 298	Special Training Provision Monthly On-the-Job Training Report.....	1 - 28
DR 344	Evaluation of Contractor .....	1 - 29
DR 439	EEO Contractor's Self-Analysis .....	1 - 30
DR 441	Identification of DBE Goal Achievement .....	1 - 34
DR 442	Identification of Work Performed .....	1 - 35
	Contractor EEO Compliance Record	

# @ Cost Overrun/Underrun Notification

Date: 1-5-2001

*This form is to be prepared by the Project Manager and submitted to the Controller Division in accordance with the instructions printed in the Construction Manual.*

Overrun  Underrun

Project No.: F-2-7(106)	Location: Nebraska City East	Control No.: 12345
Contractor: ABC Construction	Contractor No.: 9876	Letting Date: 10/21/99
		Contract No.: 1345X

Group	Item of Work	Quantity	Units	Unit Price	Amount
1	Excavation of Unsuitable Material	25,000.00	Cu Yds	\$3.17	\$79,250.00
4	Granular Material for Bedding	26.00	Tons	\$40.00	\$1,040.00
3	8" Concrete Paving	-1,395.00	Sq Yds	\$21.16	(\$29,518.20)
3	9" Concrete Paving	1,395.00	Sq Yds	\$23.59	\$32,908.05
				\$	\$0.00
				\$	\$0.00
				\$	\$0.00
				\$	\$0.00
				\$	\$0.00
				\$	\$0.00
				\$	\$0.00
				\$	\$0.00
				\$	\$0.00
				\$	\$0.00
<b>Net Change this Report →</b>					<b>\$83,679.85</b>

<b>Brief explanation of reason for Overrun / Underrun:</b>	
<p>The marshy area shown on the plans was found to extend approximately 800 feet further than anticipated (Station 60+00 and 68+00). The construction of a 48" pipe in the area was revised to be bedded with crushed rock.</p> <p>The pavement at several locations was changed from 8" PCC to 9" PCC using contract items for each to accommodate heavy trucks.</p>	
Prepared by: <i>Jack Frost, Project Manager</i>	Date: 1/5/01
Approved by: <i>(Construction Engineer)</i> Controller will obtain proper approval	Date:
Signature: <i>(Deputy Director for Engineering) – If over \$150,000</i>	Date:

*Approval signatures not required for underruns.*

### Area, Length, and Volume Conversion Factors

Quantity	From Inch-Pound Units	To Metric Units	Multiply By
Length	* mile (U.S. Statute)	m	1609.347
	mile (international)	km	<u>1.609344</u>
	yard	m	<u>0.9144</u>
	foot	m	<u>0.3048</u>
	* foot (U.S. Survey)	m	0.30480061
		mm	<u>304.8</u>
	inch	mm	<u>25.4</u>
Area	* square mile (U.S. Statute)	km <sup>2</sup>	2.589998
	* acre	m <sup>2</sup>	4046.873
		ha (10,000 m <sup>2</sup> )	0.4046873
	square yard	m <sup>2</sup>	<u>0.83612736</u>
	square foot	m <sup>2</sup>	<u>0.09290304</u>
	square inch	mm <sup>2</sup>	<u>645.16</u>
Volume	acre foot	m <sup>3</sup>	1233.4894
	cubic yard	m <sup>3</sup>	0.7645549
	cubic foot	cm <sup>3</sup>	<b>28316.85</b>
	cubic foot	L (1000 cm <sup>3</sup> )	<b>28,31685</b>
	cubic foot	m <sup>3</sup>	<b>0.02831685</b>
	100 board feet	L (1000 cm <sup>3</sup> )	0.235974
	gallon	kL (1000 L)	3.785412 x 10 <sup>-3</sup>
	1000 gallons	cm <sup>3</sup>	<b>3785412.</b>
	cubic inch	mm <sup>3</sup>	<u>16387.064</u>

@

**Note:** Underline denotes exact number.

\* Any data, in feet, derived from and published as a result of geodetic surveys will remain with the U.S. Survey foot including all stationing, land measure, and coordinate conversions.

The U.S. Survey foot, as established in the U.S. Metric Law of 1886, is based on the relationship of 1 m = 39.37 inches or 1 foot = 1200/3937 m. All conversion factors for units of land measure in this table referenced to this footnote (\*) are based on the U.S. Survey foot.

**Civil and Structural Engineering  
Conversion Factors**

Quantity	From Inch-Pound Units	To Metric Units	Multiply By
Mass	lb	kg	0.4535924
	kip (1000 lb)	<b>megagram</b> (1000 kg)	0.435924
	ton	<b>MG</b>	0.9071847
Mass/unit length	plf	kg/m	1.488164
Mass/unit area	psf	kg/m <sup>2</sup>	4.882428
Mass density	pcf	kg/m <sup>3</sup>	16.01846
Force	lb	N	4.448222
	kip	kN	4.448222
Force/unit length	plf	N/m	14.59390
	klf	Kn/m	14.59390
Pressure, stress modulus of elasticity	psf	Pa	47.88026
	ksf	kPa	47.88026
	psi	kPa	6.894757
	<b>psi</b>	<b>Mpa</b>	<b>0.006894757</b>
Bending moment, torque, moment of force	ft-lb	N•m	1.355818
	ft-kip	kN•m	1.355818
	in-lb	N•m	0.1129848
Moment of mass	lb-ft	kg•m	0.138255
Moment of inertia	lb-ft <sup>2</sup>	kg•m <sup>2</sup>	0.0421401
Second moment of area	in <sup>4</sup>	mm <sup>4</sup>	416,231.4
	ft <sup>4</sup>	m <sup>4</sup>	0.008630975
Section modulus	in <sup>3</sup>	mm <sup>3</sup>	<u>16.387.064</u>

**Note:** Underline denotes exact number.