Drilled Shafts Overview

Drilled Shaft Inspector Certification

ODOT MATERIALS & INSPECTION

Inspector role is to keep track of what the contractor does. Goal is to avoid claims.

Welcome and Introductions

- **Pete Castro, P.E., G.E.**
  ODOT Sr. Geotechnical Engineer
- **Susan Ortiz, P.E., G.E.**
  ODOT Sr. Bridge Geotechnical Engineer
- **Dustin Haas, P.E.**
  ODOT Geotechnical Design Engineer
- **Phil Wurst, P.E., G.E.**
  ODOT Senior Geotechnical Engineer
- **Drake McKee**
  ODOT Quality Control Compliance Specialist
- **Jaimé Viramontes, Sr. P.E.**
  ODOT Assistant Structure Services Engineer

ODOT MATERIALS & INSPECTION

Drilled Shafts: Class Overview

- Introduction
- Design Elements
- Construction Documents
- Equipment
- Drilled Shaft Excavation
- Reinforcement
- Concrete Operations

ODOT MATERIALS & INSPECTION

Drilled Shafts:
Class Overview (continued)

- Post Installation
- Measurement and Payment
- Contract Differing Site Conditions and Claims
- Case study
- The Test

Introduction

- Class Materials
- Terminology
- Cast of Characters
- Inspector's Roles, Duties and Responsibilities
- Documentation and Associated Responsibilities
- Safety and Environmental Concerns

Organization of Class Materials

Notebook and Appendices

Drilled Shaft Inspector's Manual (ADSC)

Checklists

ODOT 2015 Standard Specifications

OR138W: Dodge Cr/Calapooya Cr Bridge Replacements
(Resource Manual: Plans and Special Provisions)

ODOT MATERIALS & INSPECTION

SPECIAL PROVISIONS
FOR HIGHWAY CONSTRUCTION

OREGON DEPARTMENT OF TRANSPORTATION
SALEM, OREGON

GRADING, PAVING, SIGNALS

I-5: EXIT 61 (LOUSE CREEK) INTERCHANGE IMPROVEMNTS

PACIFIC HIGHWAY

JOSEPHINE COUNTY

FEBRUARY 26, 2015

48V-010

INDEX OF SHEETS	
SHEET NO.	DESCRIPTION
1	Title Sheet
1A	Index Of Sheets Cont. & Std. Drg. Nos.

STATE OF OREGON
DEPARTMENT OF TRANSPORTATION

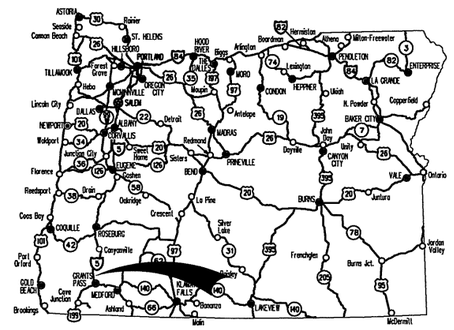
PLANS FOR PROPOSED PROJECT

GRADING, PAVING, SIGNALS

I-5: EXIT 61 (LOUSE CREEK) INTERCHANGE IMPROVEMNTS

PACIFIC HIGHWAY

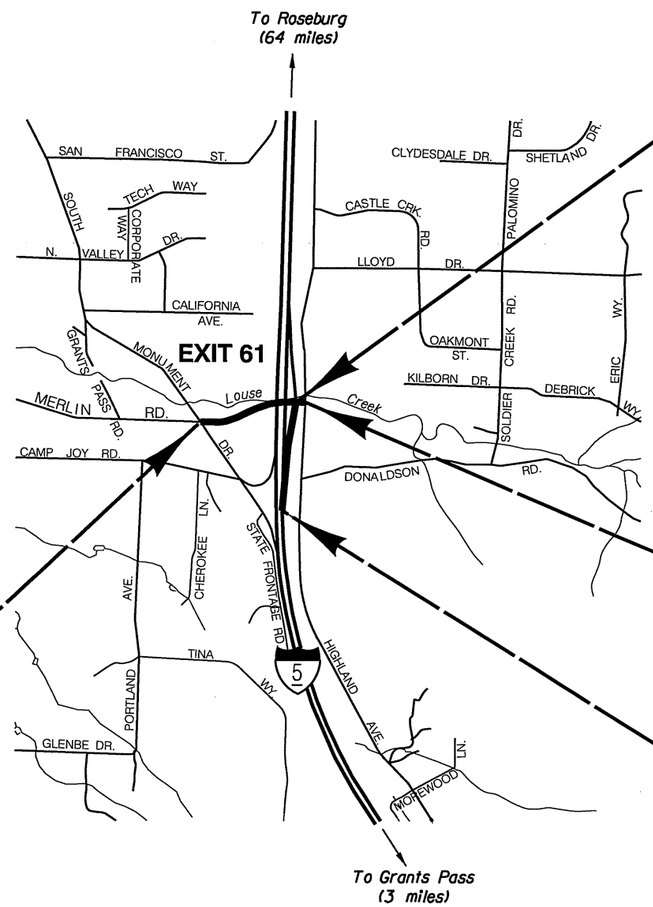
JOSEPHINE COUNTY
FEBRUARY 2015



Overall Length Of Project - 0.2 Miles

ATTENTION:
Oregon Law Requires You To Follow Rules Adopted By The Oregon Utility Notification Center. Those Rules Are Set Forth In OAR 952-001-0010 Through OAR 952-001-0090. You May Obtain Copies Of The Rules By Calling The Center. (Note: The Telephone Number For The Oregon Utility Center Is (503) 232-1987.)

SAFETY FIRST
LET'S ALL WORK TOGETHER TO MAKE THIS JOB SAFE



BEGINNING OF PROJECT NHPP-S001(456)
STA. "A" 32+95.00 (M.P. 61.50)

BEGINNING OF PROJECT NHPP-S001(456)
STA. "C" 0+00.41 (M.P. 0.0)

END OF PROJECT NHPP-S001(456)
STA. "C" 14+06.79 (M.P. 0.3)

END OF PROJECT NHPP-S001(456)
STA. "D" 39+00.00 (M.P. 61.34)

N

T. 35 S., R. 6 W., W.M.

OREGON TRANSPORTATION COMMISSION

Catherine Mater	CHAIR
Tammy Baney	COMMISSIONER
David Lohman	COMMISSIONER
Susan Morgan	COMMISSIONER
Alando Simpson	COMMISSIONER
Matthew L. Garrett	DIRECTOR OF TRANSPORTATION

These plans were developed using ODOT design standards. Exceptions to these standards, if any, have been submitted and approved by the ODOT Chief Engineer or their delegated authority.

Approving Authority: M. Thompson 12-31-2014
Signature & date

Mark Thompson, Reg. 3 Tech. Ctr. Mgr.
Print name and title

Concurrence by ODOT Chief Engineer

I-5: EXIT 61 (LOUSE CREEK) INTERCHANGE IMPROVEMNTS
PACIFIC HIGHWAY
JOSEPHINE COUNTY

FEDERAL HIGHWAY ADMINISTRATION	PROJECT NUMBER	SHEET NO.
OREGON DIVISION	NHPP-S001(456)	1

43V-105

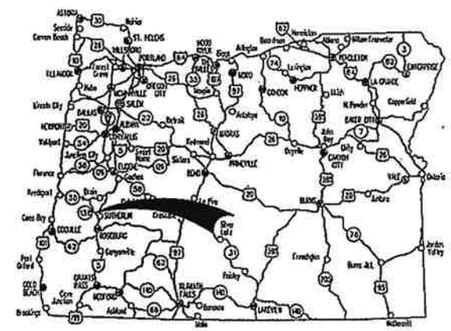
INDEX OF SHEETS	
SHEET NO.	DESCRIPTION
1	Title Sheet
1A	Index Of Sheets Cont'd. & Std. Dwg. Nos.

STATE OF OREGON
DEPARTMENT OF TRANSPORTATION
PLANS FOR PROPOSED PROJECT

GRADING, PAVING & STRUCTURES

OR138W: DODGE CR/CALAPOOYA CR BRIDGE REPLACEMENTS

ELKTON - SUTHERLIN HIGHWAY
DOUGLAS COUNTY
NOVEMBER 2010



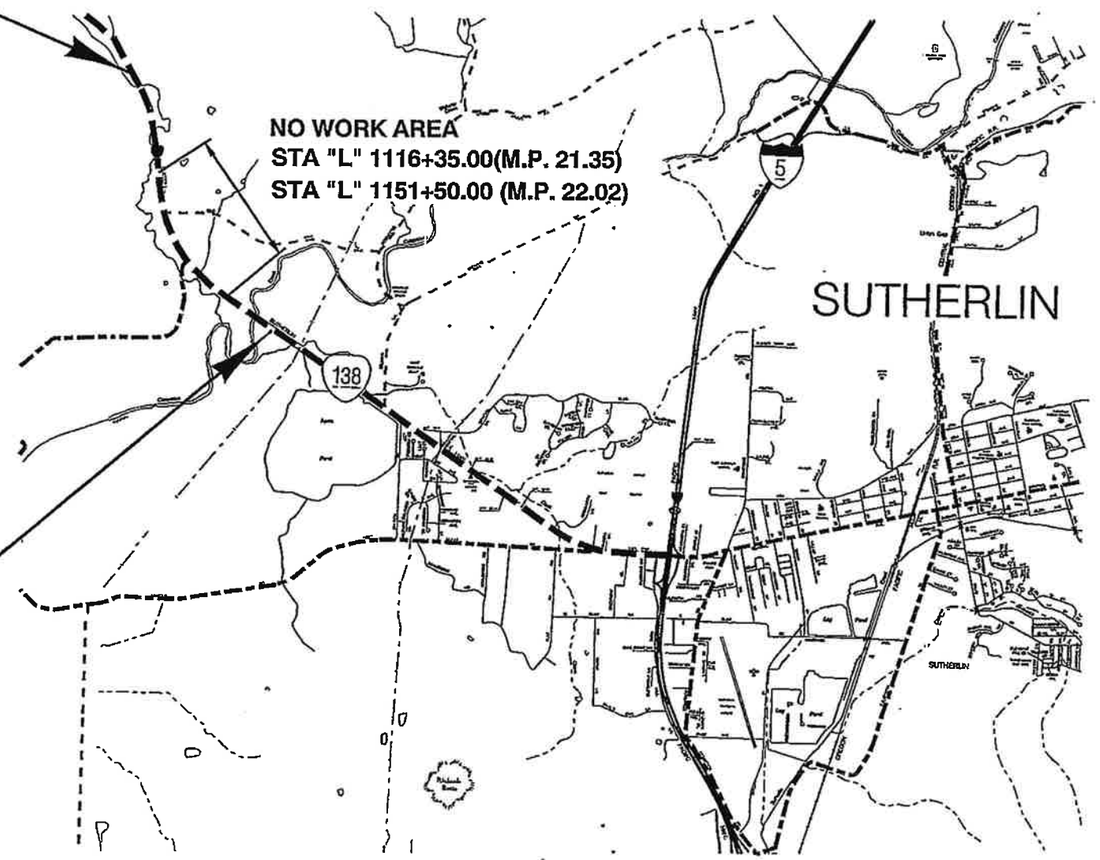
Overall Length Of Project – 0.70 Miles

ATTENTION:
Oregon Law Requires You To Follow Rules Adopted By The Oregon Utility Notification Center. Those Rules Are Set Forth In OAR 952-001-0010 Through OAR 952-001-0090. You May Obtain Copies Of The Rules By Calling The Center. (Note: The Telephone Number For The Oregon Utility Center Is (503) 232-1987.)

LET'S ALL WORK TOGETHER TO MAKE THIS JOB SAFE

BEGINNING OF PROJECT
X-BRS-S231 (011)
STA. "L" 1084+00.0 (M.P. 20.74)

END OF PROJECT
X-BRS-S231 (011)
STA. "L"1162+10.00 (M.P. 22.22)



T. 25S., R. 6W., W.M.

OREGON TRANSPORTATION COMMISSION

Gail Achterman	CHAIR
Michael Nelson	VICE-CHAIR
Mary Olson	COMMISSIONER
Alan Brown	COMMISSIONER
David Lohman	COMMISSIONER
Matthew L. Garrett	DIRECTOR OF TRANSPORTATION

These plans were developed using ODOT design standards. Exceptions to these standards, if any, have been submitted and approved by the ODOT Chief Engineer or their delegated authority.

Approving Authority: M. Thompson 8-30-10
Signature & date

Mark Thompson Reg. 3 Tech. Ctr. Mgr.
Printname and title

Concurrence by ODOT Chief Engineer

OR138W: DODGE CR/CALAPOOYA CR BRIDGE REPLACEMENTS
ELKTON - SUTHERLIN HIGHWAY
DOUGLAS COUNTY

FEDERAL HIGHWAY ADMINISTRATION	PROJECT NUMBER	SHEET NO.
OREGON DIVISION	X-BRS-S231 (011)	1

F:\ODOT_DATA\Projects\16796_DodgeCrBridges\16796.TS :: Default 8/13/2010 9:32:58 AM hwye32v

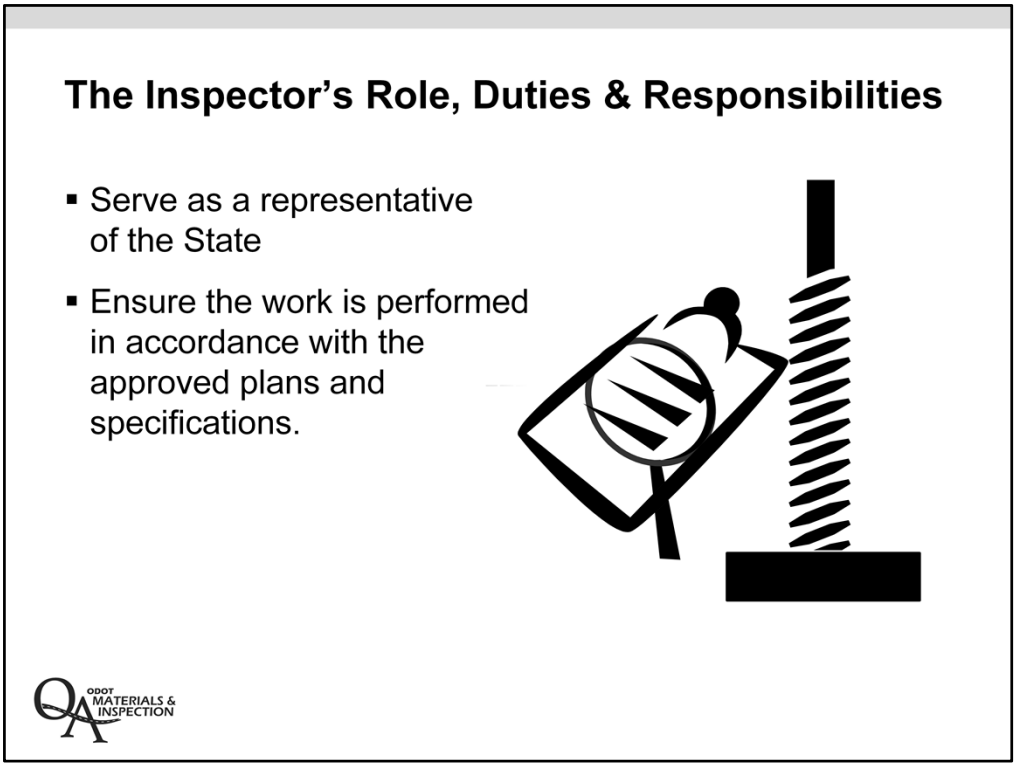
1:1200 - 001

Construction Personnel

Contractor	Charged with constructing the project
Project Manager (PM)	Authority to enforce the provisions of the Contract
Professional of Record (POR)	Responsible for project design and any design elements requiring modification
Inspector	Authorized by PM to inspect, reject and temporarily suspend the work

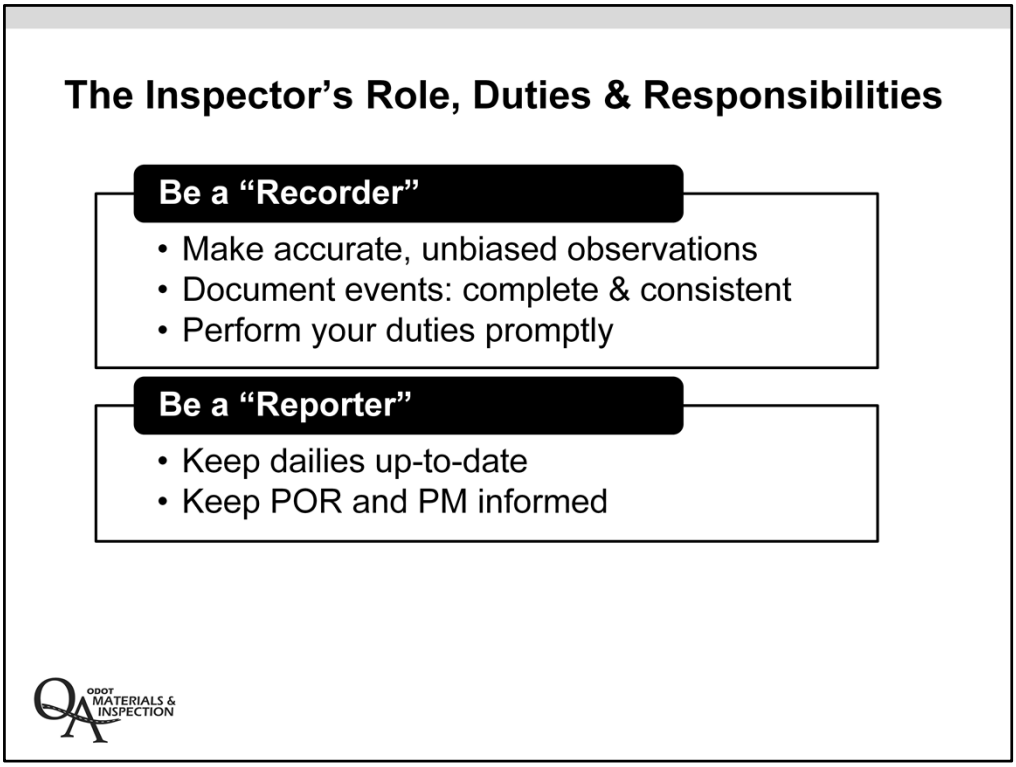
ODOT MATERIALS & INSPECTION

See Section 00150 in Standard Specifications for full details.



OVERVIEW

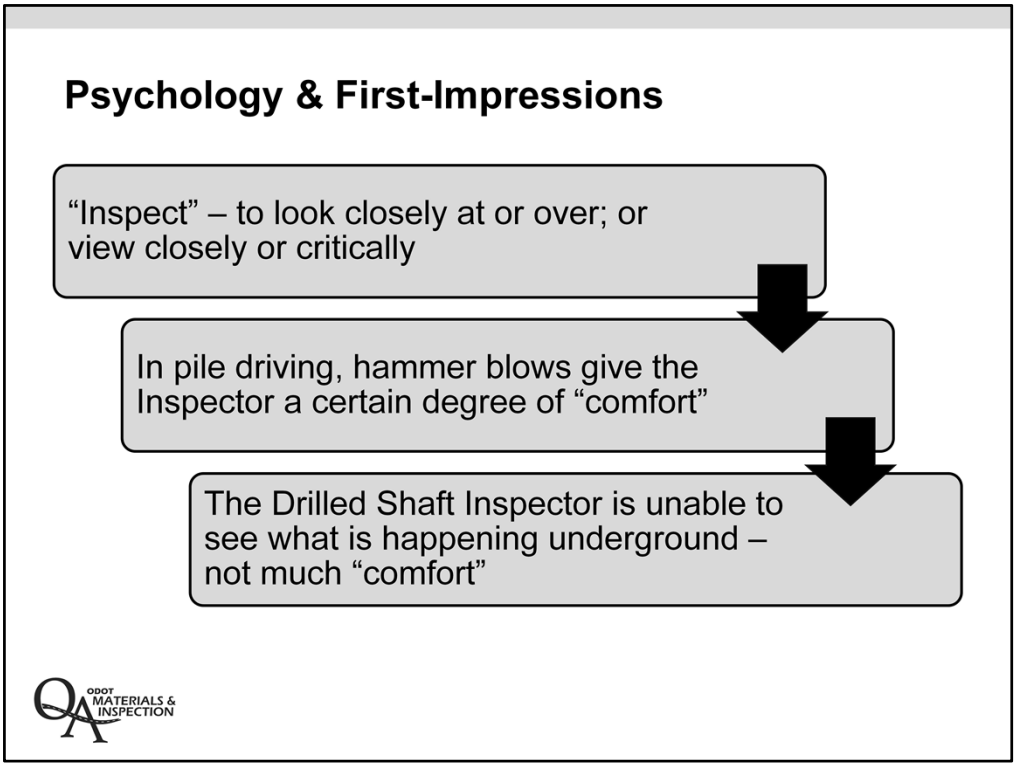
The purpose for a Drilled Shaft Inspector is to serve as a representative of the State to assure that the State gets what it is paying for. Every job is constructed with a set of guidelines called the Project Plans and Specifications. Part of the inspector's duty is to monitor the job according to the Specifications. If any part of the work is done outside of the Specifications, then it becomes imperative that it be “fixed” as quickly, inexpensively, and as safely as possible. Therefore, the Drilled Shaft Inspector serves as the eyes and ears of the Engineer, and the reporter for the job.



Inspector Attitude

The Inspector should concern themselves with making accurate, unbiased observations of all important drilled shaft construction events. This is very important if construction proceeds other than anticipated. If this is the case, the Inspector should not assume faulty operation on the part of the Contractor; the cause may be unanticipated site conditions, errors or omissions on the part of the designer, or equipment malfunction.

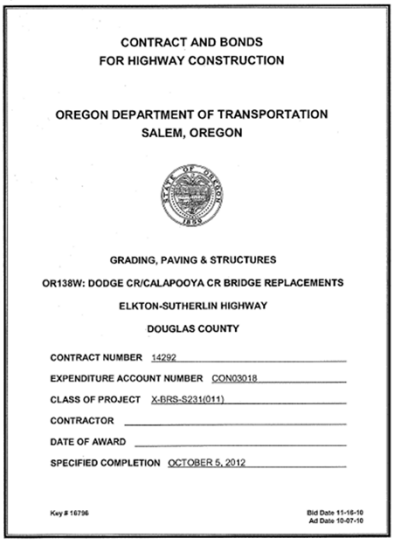
The record kept by the Inspector is the only form of tangible data to make an engineering judgment whenever installation problems arise. Elimination of potential causes can best be made on the basis of accurate and complete data observations. The Inspector should always be aware that prompt performance of these duties is required so that follow-up work can be performed expeditiously. Job progress photographs should be made. Hence the saying, ***"Document, Document, Document,"*** and be consistent with your documentation.



"What is the definition of 'inspect'?" There are certain psychological barriers to overcome with respect to drilled shaft inspection. As the word implies, inspecting something usually means seeing it. In drilled shaft construction, much of what is going on you can't see. It is below ground, and in some cases below water. You might say true, but the same can be said of pile driving as well. Yes, but psychologically there is a comfort factor in the penetration resistance or counting of blows. This gives a person a "feeling" of the foundation's worth.

In drilled shaft work, there is no such thing. With large, powerful drill units, penetrating strata of differing competence can be subtle or indistinguishable. When you add the fact that drilling equipment, and the art of drilling itself are foreign to the novice Inspector, it is easy to understand that there might be certain apprehensions about this process. These must be overcome if one is to become comfortable as a Drilled Shaft Inspector. Most would agree that the cure for these ills, is knowledge. That's why we're here.

The Inspector's Role, Duties & Responsibilities



CONTRACT AND BONDS
FOR HIGHWAY CONSTRUCTION

OREGON DEPARTMENT OF TRANSPORTATION
SALEM, OREGON

GRADING, PAVING & STRUCTURES

OR138W: DODGE CR/CALAPOOYA CR BRIDGE REPLACEMENTS

ELKTON-SUTHERLIN HIGHWAY

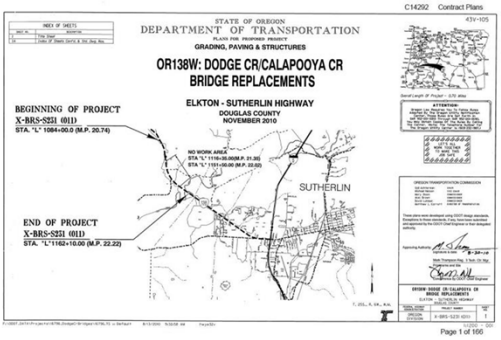
DOUGLAS COUNTY

CONTRACT NUMBER 14292
EXPENDITURE ACCOUNT NUMBER CON03018
CLASS OF PROJECT X-BRS-S231(011)
CONTRACTOR
DATE OF AWARD
SPECIFIED COMPLETION OCTOBER 5, 2012

Key # 16796 Bid Date 11-16-10 Ad Date 10-07-10

Know the Specifications

Know the Plans



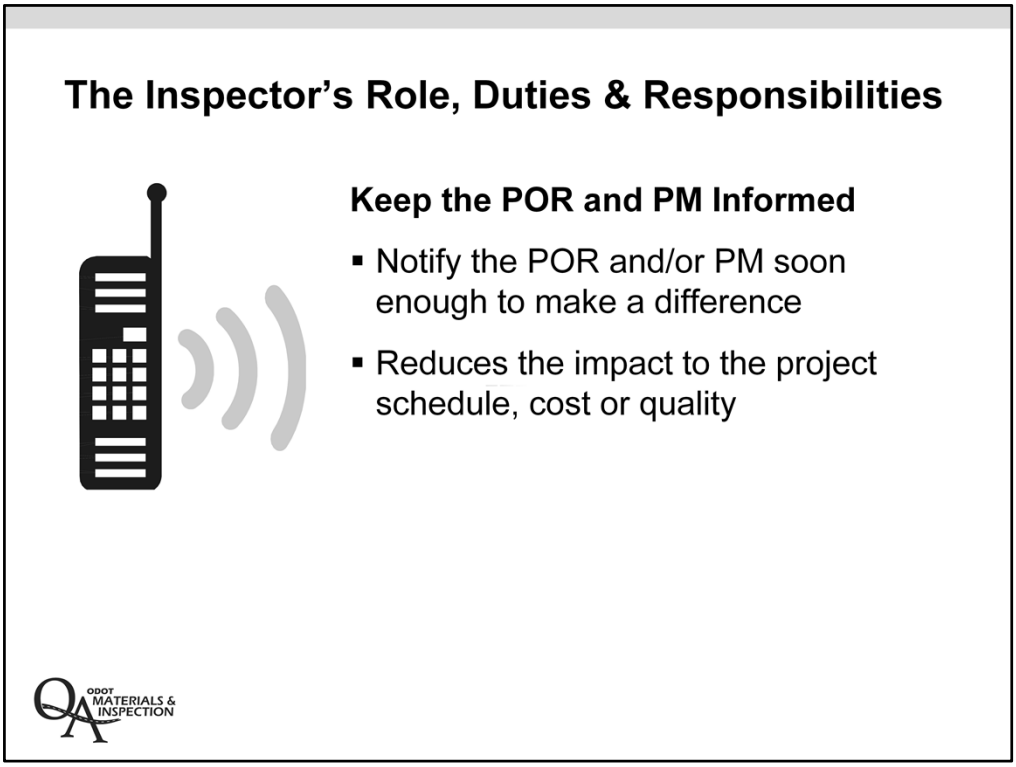
STATE OF OREGON
DEPARTMENT OF TRANSPORTATION
GRADING, PAVING & STRUCTURES
OR138W: DODGE CR/CALAPOOYA CR BRIDGE REPLACEMENTS
ELKTON - SUTHERLIN HIGHWAY
DOUGLAS COUNTY
NOVEMBER 2010
BEGINNING OF PROJECT X-BRS-S231 (011) STA. "L" 1084+00.0 (M.P. 20.74)
END OF PROJECT X-BRS-S231 (011) STA. "L" 1162+10.00 (M.P. 22.22)
SUTHERLIN

The Designer knows this project by heart, they have lived it for probably a few years. The Contractor knows each detail of constructing the shafts. They went through the plans and specs with a fine tooth comb during the bidding process. The Inspector is brought in almost at the last moment so it is imperative that you become familiar with the details of the project as quickly as possible.

The Inspector should receive, in advance of the project starting, the approved plans and Drilled Shaft Installation Plan. Review these documents for items that effect you.

The Inspector's whole purpose of being on-site is to verify that the project was built in accordance with the plans and specifications.

The specifications, in reality, outline your responsibilities. You must know the governing specifications.



It is too late to close the gate after the horses are out. Well, the same is true in performing inspection on construction projects. If you observe that something is going to be performed outside of the approved plans and specifications, notify the Contractor and immediately notify the POR and/or the PM, depending on the situation.

If you observed that the reinforcing cage construction does not appear to be in accordance with the approved plans and specifications, don't wait until the cage is in the ground, or worse yet the concrete is being placed, to say something.

Hence – DOCUMENT AND REPORT AS SOON AS POSSIBLE. REMEMBER THE PHRASE**, "SOON ENOUGH TO MAKE A DIFFERENCE."**

Check in: Explain the general role, duties and importance of the Inspector.

What is the Inspector's Role?

As a "Recorder" and "Reporter," the Inspector's duties include what?

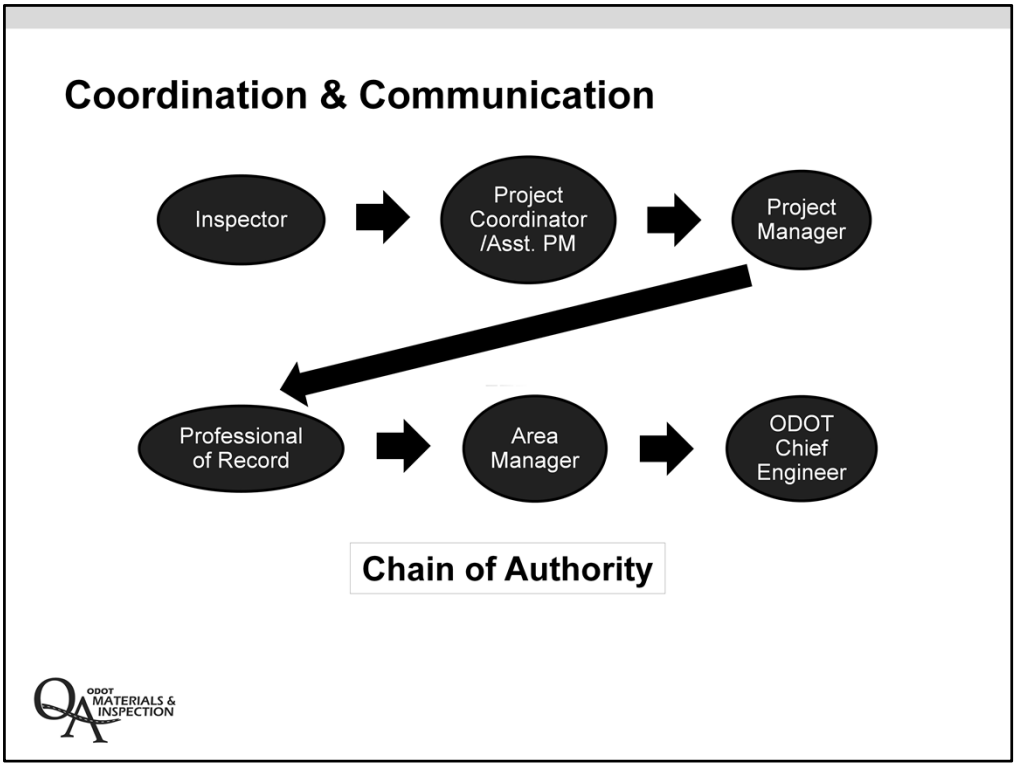
Coordination and Communication

- Remember, you are a team with a goal of constructing a drilled shaft
- If you observe potential non-conformance, notify the Contractor prior to avoid the situation occurring
- Avoid delaying Contractor

The Contractor's goal and the Inspector's goal are the same – build the project.

Communicate possible conflicts or out of tolerance work as soon as possible – you'll find that in some cases, the Contractor will begin to appreciate the heads up. If something appears to be out of conformance, tell the Contractor right away. Don't wait until the damage is done.

With proper coordination and communication, you can avoid falling into situations that can cause possible delays. For example, if you think they will be placing the cage tomorrow that you saw them constructing today, ask if so. Then make sure to get to the site early enough to do the inspection so the cage is good to go or modified, if required, in time to be ready.



Know what your communication protocol is.

Self explanatory slide.

The Drilled Shaft Coordination Meeting

- Get clarification of your duties and responsibilities
- Get clarification on any issues or disagreements you found in your review of the project documents
- If documents were unclear on elevations, etc., requiring calculations on your part, present your data to POR for approval
- Clarify line of communication and distribution
- Clarify reports required, frequency and schedule

The Inspector should attend any pre-inspection and/or pre-construction meeting.

00512.41 Drill Shaft Coordination Meeting –

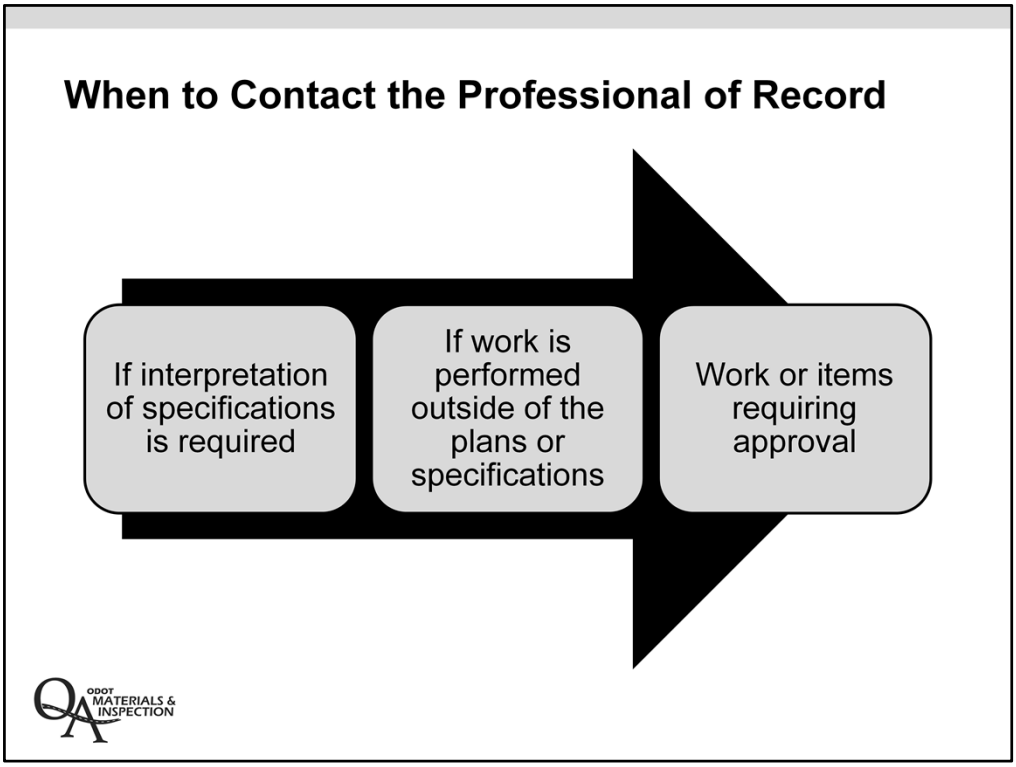
Hold a drilled shaft coordination meeting at least seven calendar days before beginning any shaft construction work at the site to discuss construction procedures, schedules, staging, personnel, equipment to be used, and other elements of the approved shaft installation plan as specified in 00512.40. If synthetic slurry is used to construct the shafts, the frequency of scheduled site visits to the project site by the synthetic slurry manufacturer's representative will be discussed. Those attending the meeting include:

Representing the Contractor – The superintendent, on-site supervisors, and all supervisors in charge of excavating the shaft, placing the casing, mixing and installing slurry (as applicable), placing the steel reinforcing bars, and placing the concrete. If synthetic slurry is used to construct the shafts, the slurry manufacturer's representative and a Contractor's employee trained in the use of the synthetic slurry shall also attend.

Representing the Contracting Agency – The Project Engineer, key inspection personnel, and designers of record or their appointed representatives. If the Contractor's key personnel change, or if the Contractor proposes a significant revision of the approved shaft installation plan, hold an additional meeting before any additional shaft construction operations are performed.

It is a good idea to give the POR a call the day before the drilling is to begin to see if he/she is going to be available the next day or two while the drilling operation is taking place. This allows the inspector to introduce themselves to the POR and find out if the POR is going to be unavailable due to meetings, vacation, furlough, etc.. Also, it's a good time to formulate a plan B and get contact phone numbers of others that are familiar with the design in case the POR is unavailable when called.

The inspector should check with their PMs to be sure of the protocol when contacting the POR. Some offices require the approval of the PM or APM prior to contacting the POR.



Your communication and coordination with the Contractor and Engineer is a significant factor in a drilled shaft project running smoothly. If the Inspector and the Contractor aren't communicating and coordinating with each other, work will be performed that is not inspected, thereby necessitating possible unpaid re-work by the Contractor. No one likes that situation.

Your initial communication should begin at the Pre-Construction meeting and, if held, a Pre-Construction Inspector's meeting conducted by the Project Manager or their representative. If your review of the plans and specifications reveals something that might be a problem, bring it to the POR's attention. If a specification clarification or applicability decision is needed, contact the POR. It is not the Inspector's responsibility to make these decisions. The Inspector monitors for conformance. Notify the PM/POR as established in your office, and document out of conformance work. Notify the Contractor of the condition outside the specifications.

See Submittals in Specifications – 00512.40

Explain the coordination and communication with the PM/POR and Contractor required of the Inspector.

When should the Inspector contact the POR and/or PM?

In situations requiring interpretation of the specifications or approvals, whom should the Inspector should contact?

Generally, the first contact for interpretation of the specifications would be the PM/APM . If the question is about a submittal, it would be best to contact the PM/APM to see where it was in the process of approval before calling the POR.

Explain the coordination and communication with the PM/POR and Contractor required of the Inspector.

Should the Inspector only contact the PM/POR when there is a problem or clarification needed?

ODOT MATERIALS & INSPECTION

ODOT Drilled Shaft Inspection Forms

Description	Form No.	Eff. Date
Drilled Shaft Inspector's Checklist	734-2625	Feb. 16
Drilled Shaft Excavation Log	734-2604	Apr. 05
Drilled Shaft Concrete Placement Log	734-2597	Nov. 11
Drilled Shaft Concrete Volumes	734-2603	Apr. 05
Drilled Shaft Inspection Report	734-2598	Aug. 09
Certificate of Materials Origin (CMO)	734-2126	Sept. 06
General Daily Progress Report	734-3474	May 12

Shaded forms are contractor responsibility.

ODOT MATERIALS & INSPECTION

Shaded forms indicate responsibility of contractor.

Discuss at pre-construction meeting that these reports are the responsibility of the contractor.

Responsibilities around Drilled Shaft Submittals

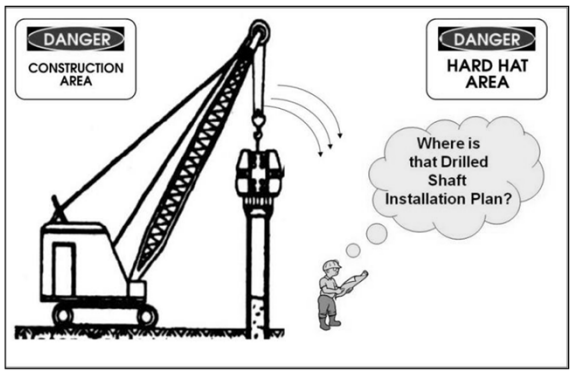
Document/ Submittal	Spec	Who Prepares it?	Who Reviews it?	Who Approves it?	Timeframe
Personnel Qualifications	00512.30	Contractor	PM Office & POR	POR	Due before construction; Agency has 21 days to review.
Installation Plan	00512.40	Contractor	PM Office & POR	POR	Due before construction; Agency has 21 days to review.
Shop Drawings	00530 00150.35	Contractor	PM Office & POR	POR	Due before construction; Agency has 21 days to process.
CSL Tests	00512.48	Contractor	PM Office & POR	POR	• Contractor informs PM office of test 3 days prior to testing • Submit test reports to the PM office within 5 days of the test
Repair Plans	00512.40(b)	Contractor	PM Office & POR	POR	Submitted after a shaft has been deemed unacceptable.
Inspection Reports	00512.40(c)	Contractor and Inspector	PM Office & POR*	NA	Submit no more than 21 days after completion and acceptance of each shaft.
Concrete Placement Logs and Volume Curves	00512.40(d)	Contractor and Inspector	PM Off*ice & POR	NA	Submit within 24 hours after completion of shaft concrete placement.
Excavation Log	NA	Inspector	PM Office & POR*	NA	Submit as part of the project record.

POR = Professional of Record, in this case, the Engineer responsible for the drilled shaft designs.
*Possibly as part of the CLS review process, and/or in the event of a repair plan and/or claim, the POR and others will be reviewing these items.

Safety
First

Safety

- ADSC: Working Safely During Installation of Drilled Shaft Foundations
- ADSC: Drilled Shaft Installation Safety Tips for the Employee



ODOT MATERIALS & INSPECTION

- Power lines are presumed to be energized unless the utility owner/operator confirms that the power line has been and continues to be de-energized and visibly grounded at the worksite.
- If the line is energized, determine what the clearance requirements are based on the voltage of the power line.
- For information, check OSHA 1926.1408

What's that buzzing sound?
SAFETY,
SAFETY,
SAFETY

Safety Issues
IFS
BOISE, IDAHO
208-367-1699
casagrande
B250

Safety Issues

See 00512.43(a) …Do not leave partially completed shaft excavations open overnight unless…If approved by the Engineer…Is covered at the surface to protect the public.

Note the safety aspect of this photo as a section of temporary casing was welded onto the permanent casing to provide a safety barrier.

00512.43 Drilled Shaft Excavation - Perform drilled shaft excavation according to the following:

(h) Clean Out - Use appropriate means, such as a cleanout bucket, pump or air lift, to clean the bottom of the drilled shaft excavations. No more than 2 inches of loose or disturbed material will be allowed at the bottom of the excavation for end-bearing drilled shafts. No more than 6 inches of loose or disturbed material will be allowed at the bottom of the excavation for side friction drilled shafts. Assume end-bearing shafts unless otherwise shown or specified. Shaft cleanliness will be determined by the Engineer.

Safety Issues

Safety Issues

Safety Issues

Caps on the rebars.

Environmental Issues

Environmental Issues
KOMATSU

Environmental Issues
Link-Belt

00290.30 (a) (2) Pollution Control: Materials and Waste Management

Locate areas for storing fuels and other potentially hazardous materials at least 150 feet away from any waters of the State and U.S. or storm inlet, unless otherwise approved by the Engineer.

When the drilled shaft rig went down it took out the power line that facilitates the operation of the temporary traffic signals. The inspector basically worked with the superintendent to make sure that all of the bases were covered. This is basically the order of what was done.

1) Make sure the operator and all of the bystanders were alright. We got lucky and the drill rig landed so that the cab side was up and so nobody was hurt.
2) Since the signal went down a couple of laborers had to start flagging traffic.
3) The inspector called the APM and the superintendent called his boss. The superintendent also ordered some flaggers from the Union hall.
4) The inspector noticed a slight sheen of oil on the water and so he had the contractor get out a spill kit and start cleaning up. The inspector also informed the superintendent that the spill response company needed to be involved. As part of the approved pollution control plan the contractor had already set up an agreement with a spill response company, Northwest Hazmat in this case. NW Hazmat contacted the DEQ to keep them in the loop. If they hadn't, ODOT would have had the contractor do it.
5) The APM informed the PM and then called Station 2 dispatch who sent a first responder to the project. The First Responder was a great asset to the inspector and was able to provide advice to the inspector. Since he is also employed by ODOT it made it easier to trust his advice.
6) Since this was an OBDP job, the APM called the OBDP environmental monitor. This could have also been done by the inspector. (The ODOT REC and Hazmat professionals are not involved with this project because OBDP covers it.) If it was not an OBDP job the APM would have called the ODOT Hazmat guy and the REC.

7. NW Hazmat showed up and was basically the only action for the rest of the day and during the following day. They were on site all night. There was a 300 gallon hydraulic reservoir on the rig and approximately 100-gallons of diesel in the rig, which made everyone nervous, but did not release. The diesel was pumped from the tank but the hydraulic oil was not because of the construction of the drill rig, which had an interior bladder system, and the fear that it would make the extraction of the equipment extremely difficult. We basically left this decision up to NW Hazmat and just followed their advice.
8. The APM should have then informed the Public Relations officer, but didn't think of it. It wasn't long before he contacted the APM because the media had already got the word somehow and called him. Multiple reporters showed up later in the day and the PR officer handled them. ODFW and OSP also stopped by briefly.
9. The drilled shaft subcontractor had people fly in from Idaho, which is where their headquarters are. They were on site by early afternoon. They were running around interviewing witnesses, which was being video recorded with an iPad. The inspector asked the APM whether he should agree to an interview and the APM and the PM told him that he could be interviewed. They told him to refrain from casting any blame or saying anything about what he thought caused the incident.
10. The next action was the extraction of the equipment. The inspector contacted the APM with the contractors extraction plan, which involved the removal of a few trees that we let them cut.
11. Just prior to lifting the drill rig out of the creek the inspector had a meeting with everyone on site. Locations for people to stand and hand signals were developed. This made the extraction go smoothly.

The inspector basically kept his finger on the pulse of what was going on in the field. He gave the APM regular updates and made sure that the contractor was following the recommendations of the Hazmat company. He also made sure that the traffic control was operating smoothly. The inspector also discussed the situation with all of the visitors and entities that showed up, most of whom are employed by ODOT. He also documented everything that went on and took photos.

Looking back on it in the APM’s opinion, he believes that the best thing that we did was to maintain transparency with everyone from the beginning.

Safety and Environmental Issues

Review

- Inspector's Roles, Duties and Responsibilities
- Documentation and Associated Responsibilities
- Safety and Environmental Concerns

ODOT MATERIALS & INSPECTION