18. Appendix

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18.1. Table 1, Project Milestones

The following milestones and their dates will be documented by another section such as Contracts or Preconstruction.

- Constructability Review. This is often included with the PS&E, it is described in the Highway Preconstruction Manual 450.18.

- PS&E Review. This is construction's last chance to review the project design before it goes out to bid. See ACM 3.2 and Highway Preconstruction Manual 450.19.

- Bid Opening. Bids are opened by contract section. Starts various actions and submittals required of the contractor before Award. See ACM 3.4 and Highway Specification 103-1.01.

- Intent to Award. Indicates the Department's intention to award to a bidder, and the letter is used to convey documents to that bidder for signature. See ACM 3.4 and Highway Specification 103-1.03.

- Escrow Document Delivery. When required by special provision.

- Subcontract List. Submitted by contractor within 5 days of receiving notice of Intent to Award. See ACM 3.4 and Highway Specification 103-1.02.

- Award of Contract. This indicates the contract has been signed, required documents received, and the bid is awarded to the Contractor. See ACM 3.4 and Highway Specification 103-1.03.

The following milestones and dates should be documented by letter or email between the project engineer (or Group Chief/PM) and the contractor. Letters may combine milestones (such as a completion date and a transfer of maintenance responsibilities). This is not an all-inclusive list. Examples of letters are in Chapter 17 Exhibits.

- Notice to Proceed. This authorizes construction and indicates the date that contract time starts. See ACM 3.4 and Highway Specification 108-1.02.

- Preconstruction Conference. This is the first group meeting of the Project Engineer, contractor, and other interested parties. See ACM 3.8 and Highway Specification 108-1.03.

- Notice of Work and Notice of Completion. Requirements of the Department of Labor for the contractor. See ACM 3.8 and 16.2, and Highway Specification 107-1.04.

- Date that the Engineer determines the conditions for ending CGP coverage have been met.

- Notice of Intent and Notice of Termination. A requirement of the Department of Environmental Conservation for the contractor and the Department. See ACM 3.11 and 9.9.6, and Highway Specification 641-1.01.

- Seasonal suspension of work. See ACM 14.3 and 9.9.5, and Highway Specification 643-3.07.

- Contractor maintenance ends. This indicates when the Department will take over some or all maintenance activities. See ACM 15.3 and 15.6, and Highway Specification 105-1.13.

- Final Inspection. The owner, contractor, other interested DOT&PF groups, and funding agencies inspect the project before closeout. See ACM 15.1 and Highway Specification 105-1.15.

- Substantial Completion. This indicates that the project is usable by the public. It also affects the amount of liquidated damages and may affect the contractor's maintenance responsibilities. See ACM 15, and Highway Specification101-1.03 (definition) and 105-1.13 thru 1.15.

- Partial Completion. The Department accepts a geographically separate portion of the project as being substantially complete. See ACM 15.3 and Highway Specification 105-1.14.

- Project Completion. The Department accepts the entire project as physically complete and stops contract time. See ACM 15.6 and Highway Specification 105-1.15.

- Date Contract Time stops. Normally this is at Project Completion. See ACM 14 and 15.6, and Highway Specification 105-1.15.

- Final Acceptance. This closes the Contract Agreement (except for bonding and warranties) after all work is complete, records are submitted, and final payment made to contractor. See ACM 16.4 and Highway Specification 105-1.16.

18.2. Table II, Posting Requirements for DOT&PF Field Offices, All Projects

Required posters include all those listed on the Division of Personnel website at http://doa.alaska.gov/dop/resources/mandatoryPosters/ plus other posters required by law or funding agency (+).

Office of Federal Contract Compliance Programs: http://www.dol.gov/ofccp/regs/compliance/posters/ofccpost.htm

+ **Alaska Whistleblowers Act,** (AS 39.90.100)

+ **Contact Information** for Safety Conscious Work Environment and for Employee Safety Concerns Program (see ECP Manual for information) Attach to bottom of Sexual harassment is Prohibited poster.

+ **Drug Free Workplace Act of 1988,** Required for Federal funding (41USC701).

+ **Emergency Phone Numbers** (Doctors, hospitals and ambulance or 911) must be posted. ADOL's Poster DOSH 51 may be used. Required by OSHS 01.0501(h).

Employer's Certificate of Self-Insurance, Alaska Department of Labor. Required by AS 23.30.060.

Equal Employment Opportunity is the Law, Federal EEO Commission (Poster EEOC-P/E-1), and

+**"EEO is the Law" Poster Supplement.** Required by 29 CFR 1601. 30.

It's Your Right to Know –Safety and Health Protection on the Job, Alaska Department of Labor, Standards and Safety. Required by AS 18.60.010 to .105.

Notice to Employees – Federal Minimum Wage, U.S. Dept. of Labor Wage & Hour Division (Notice WH 1088). Required by 29 CFR 516.4

Notice to Employees - Unemployment Insurance, Alaska Department of Labor, Employment Security Division,

Form 07-1012. Required by 8 AAC 85.060.

+ **Policy on Discriminatory Treatment of Individuals with Disabilities,** Alaska Department of Administration, Office of EEO. Poster required by Administration Order 129, Section X-A.

Sexual Harassment is Prohibited, Alaska Commission for Human Rights and Federal EEO Commission.

+ **Smoking Prohibited by Law,** Alaska Dept. of Environmental Conservation, Sign 18-1140. Required by AS 18.35.330.

Summary of Alaska Wage and Hour Act, Alaska Department of Labor. Required by AS 23.10.105.

Summary of Alaska Child Labor Law, Alaska Department of Labor.

You have a Right to a Safe and Healthful Workplace (It's the Law- Job Safety and Health), Alaska Department of Labor, Labor Standards Division (Poster DOSH 2003). Required by OSHS 01.0102(c).

Your Rights Under the Family and Medical Leave Act, U.S. Dept. of Labor Wage & Hour Division (Notice WH 1420 or duplicated text). Required by 29 CFR 825.300.

USERRA - The Uniformed Services Employment and Reemployment Rights Act, U.S. Dept. of Labor Wage & Hour Division.

Table II, Posting Requirements for DOT&PF Field Offices, All Projects

Common Additional Requirements

ARRA – Know your Rights Under the Recovery Act! Poster required on projects funded under American Recovery and Reinvestment Act of 2009. For more information go to website: www.recovery.gov

Building Permit, from State Fire Marshal.

Construction Permits from local governments.

Material Safety Data Sheets/Safety Data Sheets (OSHA Form 20) for toxic or hazardous substances or agents to which

employees may be exposed. Required OSHS 15.01.01(h).

Materials Source and Wetlands Permits, from U.S. Corps of Engineers.

Nuclear/Radioactive Material Warning Signs and Radiation Incident Reporting Information Sheet, required where radioactive materials are present.

Note: This list is not comprehensive; many other posting requirements apply in specific circumstances (e.g. asbestos removal, transportation of hazardous materials).

18.3. Table III, Posting Requirements in Contractor Offices

The contractor is responsible for required posters, including all those listed on the Department of Labor and Workforce Development website at http://www.labor.alaska.gov/lss/posters.htm plus other posters required by law or funding agency including FHWA website http://www.fhwa.dot.gov/programadmin/contracts/poster.cfm.

Table III, Posting Requirements in Contractor Offices **Required by DOT&PF Construction Contracts**		
	Federal Aid Projects	**State Funded Projects**
Contractor's Civil Rights Representative, DOT&PF Form 25A-302, completed by contractor.	x	X
Contractor's Company Equal Employment Opportunity Policy, prepared by contractor.	x	X
Federal Davis-Bacon Wage Determinations, "Davis-Bacon rates determined by U.S. Department of Labor, attached to either the: **Notice to all employees…on Federal…Projects,** U.S. Dept. of Labor Wage & Hour Division Poster WH 1321; or **Wage Rate Information – Federal Aid Highway Project,** FHWA Poster FHWA-1495.	x	
Labor's & Mechanics' Minimum Rates of Pay (Pamphlet 600), determined by Alaska Department of Labor and Workforce Development.	x	X
Notice of Intents, From ADEC's APDES system, contractors and departments, **Name and phone number of SWPPP Manager**, and **Location of SWPPP** available for public viewing. Must be posted outside the office and near the beginning and end of the project, in accessible locations.	X	X
Falsification Notice, FHWA-1022	**FHWA only**	

Note:

1. This is a standard list of postings required by our contracts. Individual contracts may contain language requiring additional posting requirements.
2. **Beginning in 2016 there is a new "EEO is the Law" Poster Supplement required on Federal-Aid projects.**

18.4. Table IV, Filing System Guide

Table IV, Filing System Guide, (section 4.2)

A. Contract Files

1. Conformed Contract (including half-size plans)
2. Engineers Estimate and Bid Tabulations
3. Directives
4. Change Documents
5. Utility Installation/Relocation Agreements (including payment authorizations/requests)
6. Professional Service Agreements (including amendments and payment authorizations)

B. Correspondence and Report Files

1. Contractor correspondence (including Letter of Award, Notice to Proceed, Progress Schedules, TCP, SWPPP, HMCP)
2. Claims (separate files for each situation, if more than one, and a separate file for Attorney-Client Privilege correspondence)
3. All other correspondence (intra-departmental, inter-agency)
4. Project Construction Reports (weekly/semi-monthly reports)
5. Computer-generated Progress Reports (Engineer's diary, inspector's daily reports)
6. All other reports (safety meeting reports, SWPPP inspection reports, federal agency inspection reports, quality assurance/review reports, accident reports, and Departmental inspection reports.

C. Pay Estimate and Quantity Files

1. Progress Payment Estimates
2. Pay Item Files (set up files for each contract pay item, as needed, to contain or reference the calculations for progress estimate pay quantities).

D. Material Files

1. Material Test Results and Reports (set up files for each contract pay item and type of test, as needed)
2. Pending and Approved Materials Submittals (including Project Materials Reports)

E. Administrative Files

1. Master Index
2. State Funding Information (PDA's, encumbrance memos)
3. Federal Funding Agreements (including amendments and payment requests)
4. Permits (material sources, environmental, building)
5. Overtime Authorization Requests
6. Personnel Files (files for each employee including delegations of authority and assignment memos, time sheets, travel vouchers)
7. Stock Requests
8. Bills, Invoices, Vouchers (for office, utilities, supplies, equipment)
9. Project Engineer's Equipment Inventory
10. Photographic Records (photo albums, video index)

F. Design/Project Development Data Files

1. Materials Report
2. Design Files (including original bid quantity calculations)
3. Right-of-Way Information
4. Project Survey Data

Only one file in each category may be necessary to accommodate each of the six general categories of files, depending on a project's volume and type of paperwork; other projects may require many files under some of the sub-categories (such as pay item and personnel files).

18.5. Table V, Reference Books, Manuals, Polices

Table V, Reference Books, Manuals, Policies, (section 4.7)						
Required	**Federally Funded**			**State Funded**		
	HWY	**AIR**	**MAR**	**HWY**	**AIR**	**MAR**
AASHTO-Standard Specifications for Transportation Materials	R	R	R	R	R	R
ADEA, ASEA, Local 71-Collective Bargaining Agreements	X	X	X	X	X	X
ADOL-Construction Code for Occupational Safety & Health Standards	X	X	X	X	X	X
ADOL-Wages and Hours of Laborers…. (Pamphlet No. 400)	X	X	X	X	X	X
DOT&PF-Alaska Construction Manual	X	X	X	X	X	X
DOT&PF-Alaska Oversize & Overweight Permit Movements	X	A	A	X	A	A
DOT&PF-Alaska Product Preference Program Preparation Pamphlet				A	A	A
DOT&PF-Alaska Test Methods Manual	X	X	A	X	X	A
DOT&PF-Qualified Products List	X	X	X	X	X	X
DOT&PF-Policy and Procedures Manual	R	R	R	R	R	R
DOT&PF-Standard Drawings (for Highways)	X		A	X		A
DOT&PF-Standard Specifications for Highway Construction	X		X	X		X
DOT&PF-Storm Water Pollution Prevention Plan Guide	X	X	A	X	X	A
Alaska Statutes, Alaska Administrative Code	R	R	R	R	R	R
ASTM-American Society for Testing Materials Test Methods	R	R	R	R	R	R
FAA-Advisory Circular 150/5345-1A, Approved Airport Lighting Equipment		X			X	
FAA-Advisory Circular 150/5370-2C, Safety on Airports During Construction		X			X	
FHWA/DOT&PF-Alaska Traffic Manual	X	A	A	X	A	A
U.S. DOT-Shipping and transporting requirements (for hazardous materials)	R	R	A	R	R	A
Recommended						
ADCED-Alaska Products Preference List				A	A	A
ADOA-Risk Management Division Claims Reporting Procedures Manual	R	R	R	R	R	R
DOA-State Personnel Rules	R	R	R	R	R	R
DOT&PF-Airport Standard Specifications		X			X	
DOT&PF-Asphalt Pavement Inspector's Manual	A	A	A	A	A	A
Appendix A, 23 CFR 230 (EEO Program)		X				
Asphalt Institute Manual Series	A	A	A	A	A	A
Code of Federal Regulations	R	R	R	R	R	R
FAA-Advisory Circulars		R			R	
FAA-AIP Handbook		X				
FHWA-Federal Aid Program Guide	X		X			
Hot Mix Asphalt Paving Handbook (AASHTO, FAA, FHWA, US Army Corps)	A	A	A	A	A	A
US EPA-NPDES General Permit for Storm Water Discharges	A	A	A	A	A	A
USDOL-Field Operations Handbook, Chapter 15	X	X	X			
X=entire book R=Applicable sections only A=only if applicable						

Table V (continued), Regional Office Reference
AASHTO-Standard Specifications for Transportation Materials and Methods of Sampling and Testing
ADOA-State Personnel Rules
ADOA-State Procurement Reference Manual
DOT&PF Alaska Construction Manual
DOT&PF Policy Manual (DPOL); Policy and Procedures Manual; Procedures Manual (DPDR)
DOT&PF Pre-Construction Manual
DOT&PF Procurement Policy and Procedure Manual
DOT&PF-Alaska Oversize and Overweight Permit Movements manual
Alaska Administrative Code
Alaska Statutes
ASTM-American Society of Testing Materials Standards
FAA-Advisory Circulars
FAA-AIP Handbook
FCC-Radio Communications Procedures
NRC Regulations (applicable sections)
Rental Rate Blue Book for Construction Equipment, Volumes 1-3
USDOT-Shipping and Transporting Requirements

18.6. Table VI, Field Lab Testing Equipment

Table VI - Field Lab Testing Equipment (See Section 5.2)	
Basic Aggregate and Soils Lab	
1” and 3” bristle brushes – (2 each)	Gloves
10’ and 100’ tape measures (one each)	Handling pans (2-3 each)
100 and 1,000 ml graduated cylinders (2-3 each)	Large and small flathead screwdrivers (one each)
18”x18”x3” pans (6-8 each)	Large and small sample splitters with pans (one each)
2”-3” paintbrush for splitter pans	Large and small scoops (2-3 each)
3-5 pound sledge hammer	Large digital scale
5 gallon buckets (10-20 each)	Large Gilson shaker with timer
6’ folding ruler	Large magic markers (3 each)
6” proctor mold, 10 lb. hammer, 12” beveled straightedge	Large spoons (3 each)
9”x12” pans (6-8 each)	Liquid limit machine with grooving tool, spatula and tins
Alaska Construction Manual	Nested sieves (#4 and ¾” and 3”) full height
Alaska Test Methods manual	No. 10 pre-screen (2 each)
All purpose cleaner/degreaser 32 oz.	No. 200 wash sieves (2 each)
Armored thermometers, 0° to 400° F (3 each)	Nuclear densometer (moisture/density gauge with reference stand, rod, scraper, plate, and charger
Bench brush, broom, dustpan	Round point and square point shovels (2-3 each)
Calculator (2 each)	Sample bags and liners (10-15 each)
Canvas for quartering	Set of large sieves (4” through No. 4)
Clipboards	Set of nested sieves (8 inch or 12 inch diameter) including 4”, 3”, 2”, 1 ½”, 1”, ¾”, ½”, 3/8”, No. 4, No. 8, No. 10, No. 16, No. 20, No. 30, No. 40, No. 50, No. 80, No. 100, No. 200, pan, lid
Digital Scale	Sieve brushes (soft and wire bristle) (one each)
Dust masks (one package, double band)	Sieve shaker, 12”
Ear Plugs (box of 100)	Specific gravity bucket with suspension apparatus
Electrical surge protector	State of Alaska aggregate worksheets
Extension cords	State of Alaska density worksheets
Fire extinguisher	Stop watch
First aid kit	Transmittal forms
Forced air oven	Water Bath with overflow and heated circ. system
Garbage bags	Waterproof field books (10/box)
	Zip poly bags, quart size (many)
Table VI - Additional for Asphalt Lab	
1 gallon plastic jug or glass sampling containers (6)	Gloves (heat resistant)
1 liter flasks with stopper (2 each)	Hot plate for tools
1 quart sampling cans with lids and labels (12)	Insulated box for transporting hot mix
1”x6” spatula (2 each)	Large road sign (asphalt sample splitter)
Absolute pressure gauge or Manometer	Liquid soap or dispersing agent (1 quart)
Absorbent pads for spills and cleanup (1 bundle)	Nuclear asphalt content gauge with accessory kit
Aluminum foil	Scale fitted with a suitable suspension apparatus and holder to permit weighing the cores
Asphalt ignition oven with accessory kit with carbon monoxide detector, or nuclear asphalt content gauge with pans	Sealing tape (not duct tape)

Asphalt sample boxes, pails or plate	Silver spray paint
Asphalt saw (wet to separate core lifts)	Small spatulas or putty knives (2)
Asphalt thermometer to 550° F	Splitting paper
Asphalt trowel for splitting samples (2 each)	Spray lubricant & rust preventative
Citrus based solvent (1 gallon)	State of Alaska asphalt worksheets
Cooking spray, high heat, non-sticking	Thermometer 66° to 80° F, graduated in 0.2° F, for cores
Dial thermometers, 50° to 500° F (6 each)	Thermometer accurate to 0.9° F (digital) or calibrated liquid in glass
Electrical surge protector	Vacuum pump or water aspirator, capable of removing air from container to 30 mm HG
Flat bottom scoop	Vacuum pycnometer (2000 g)
Additional for Concrete Lab	
8” torpedo level	Reference Thermometer (Readable to 0.5° F)
Airmeter, complete	Rubber mallet (1.25 +/-0.5 lbs.) for up to ½ ft³ measure
Aluminum/Acrylic plate screed	Scale
Board for slump test, non-absorbent surface	Slump cone
Canvas or burlap wheelbarrow cover	Small shims or wedges
Concrete cylinder molds with lids or plastic wrap (12 each)	Squirt bottle
Concrete thermometer, 25° to 125° F (+/-1° F) (2 each)	State of Alaska concrete worksheets
Grout Cube Mold with accessories	Tamping rod, 5/8”x24” with rounded ends
Hand brush for cleanup	Wheel barrow (4 ft³ capacity)
Insulated box or cooler for cylinders	
Latex gloves	
Maximum-minimum thermometer, 30° to 200° F (may need wider range for cold temperatures)	

18.7. Table VII, Materials Sample Identification System

Table VII, Materials Sample Identification System, also see ACM 5.4

Each materials sample taken on a construction contract project will be assigned a four part number that identifies the type of sample, the type of material, the test that will be performed on the sample, and the sequential number of the test in that series on that type of material and sample. When a test sample fails to meet the specifications, the test number is circled in the Materials Testing Summary. A retest of a failing test is identified by adding the letter "A" after the test number for the first retest; a second retest adds the letter "B", and so on. Samples sent to the regional lab for testing will also be identified by this system, in addition to the project name and number, the location the sample was taken, and the name of the sampler. This sample identification system will be used on test results from the field lab and from the regional lab, and on the Materials Testing Summary form. (This table is duplicate of ATMM SP-12. Codes verified on 4/2016)

Types of Samples

Acceptance	No prefix	Information	I
Independent Assurance	IA	Quality	Q

Types of Materials

Aggregate Base Course	BC	Gas Line Conduit	GC
Aggregate Surface Course	SC	Hot Mix Asphalt	HMA
Asphalt Cement	AC	Grout	GR
Asphalt Pathway	AP	Manhole Type (I, II, III)	MH(_)
Asphalt Sidewalk	AS	Medium Cure Liquid Asphalt	MC
Asphalt Surface Treatment	AST	Mineral Filler	MF
Asphalt Treated Base Course	ATB	Performance Grade Liquid Asphalt	PG
Bed Course Material	BCM	Porous Backfill	PB
Bedding and Backfill	BB	Reclaimed Asphalt Pavement	RAP
Borrow Material Type (A, B, C)	BM(_)	Rip Rap	RR
Common Excavation	CX	Rock Excavation	RX
Concrete Coarse Aggregate	CA	Sewer Conduit	SC
Concrete Fine Aggregate	FA	Sidewalk	SW
Cover Coat Grading B	CCB	Stone Mastic Asphalt	SMA
Crushed Asphalt Base Course	CABC	Structural Backfill Material	B
Culvert	C	Structural Plate Pipe	SPP
Ditch Lining	DL	Subbase	SB
Electrical Conduit	EC	Telephone Conduit	TC
Electrical - Miscellaneous	EL	Television Conduit	TV
Emulsified Asphalt Materials	EAM	Top Soil	TS
Emulsified Treated Base	ETB	Type A Inlet	AI
Field Inlet	FI	Unclassified Excavation	EX
Filter Blanket	FB	Useable Excavation, Type (A, B, C)	EX(_)
Filter Material	FM	Waste	EXW
Fire Hydrant	FH	Water Conduit	WC
Foundation Fill	FF	Waterline	WL
Gabion Backfill	GB	Warm Mix Asphalt	WMA

Types of Tests

Correction Factor – Ignition Oven	CF	Mix Design	MD
Field Density	D	Moisture	M
Fracture Count	F	Oil Content	O
Gradation	G	Plastic Index	PI
Joint Density	JD	Plastic Limit	PL
Liquid Limit	LL	Standard Density	SD

18.8 Materials Sampling & Testing Frequency Table for Highways

The non-project specific MSTF tables for highways are on the D&ES Statewide Materials website at:
http://www.dot.state.ak.us/stwddes/desmaterials/mat_resource.shtml

18.9 Materials Sampling & Testing Frequency Table for Airports

A project specific MSTF table for airports may be in the contract.
The non-project specific MSTF tables for airports are on the D&ES Statewide Materials website at:
http://www.dot.state.ak.us/stwddes/desmaterials/mat_resource.shtml

18.10 Table X, Reserved

18.11 Table XI, Reserved

18.12 Table XII, Reportable Quantities of Hazardous Substances

Table XII, Federal Reportable Quantities of Hazardous Substances Designated Pursuant to Section 311 of the Clean Water Act - The State of Alaska requires all hazardous substance spills to be reported, regardless of quantity.

Material	Category	RQ in pounds (kg)
Acetaldehyde	C	1,000 (454)
Acetic acid	D	5,000 (2,270)
Acetic anhydride	D	5,000 (2,270)
Acetone cyanohydrin	A	10 (4.54)
Acetyl bromide	D	5,000 (2,270)
Acetyl chloride	D	5,000 (2,270)
Acrolein	X	1 (0.454)
Acrylonitrile	B	100 (45.4)
Adipic acid	D	5,000 (2,270)
Aldrin	X	1 (0.454)
Allyl alcohol	B	100 (45.4)
Allyl chloride	C	1,000 (454)
Aluminum sulfate	D	5,000 (2,270)
Ammonia	B	100 (45.4)
Ammonium acetate	D	5,000 (2,270)
Ammonium benzoate	D	5,000 (2,270)
Ammonium bicarbonate	D	5,000 (2,270)
Ammonium bichromate	A	10 (4.54)
Ammonium bifluoride	B	100 (45.4)
Ammonium bisulfite	D	5,000 (2,270)
Ammonium carbamate	D	5,000 (2,270)
Ammonium carbonate	D	5,000 (2,270)
Ammonium chloride	D	5,000 (2,270)
Ammonium chromate	A	10 (4.54)
Ammonium citrate dibasic	D	5,000 (2,270)
Ammonium fluoborate	D	5,000 (2,270)
Ammonium fluoride	B	100 (45.4)
Ammonium hydroxide	C	1,000 (454)
Ammonium oxalate	D	5,000 (2,270)
Ammonium silicofluoride	C	1,000 (454)
Ammonium sulfamate	D	5,000 (2,270)
Ammonium sulfide	B	100 (45.4)
Ammonium sulfite	D	5,000 (2,270)
Ammonium tartrate	D	5,000 (2,270)
Ammonium thiocyanate	D	5,000 (2,270)
Amyl acetate	D	5,000 (2,270)
Aniline	D	5,000 (2,270)
Antimony pentachloride	C	1,000 (454)
Antimony potassium tartrate	B	100 (45.4)
Antimony tribromide	C	1,000 (454)
Antimony trichloride	C	1,000 (454)
Antimony trifluoride	C	1,000 (454)
Antimony trioxide	C	1,000 (454)
Arsenic disulfide	X	1 (0.454)
Arsenic pentoxide	X	1 (0.454)
Arsenic trichloride	X	1 (0.454)
Arsenic trioxide	X	1 (0.454)
Arsenic trisulfide	X	1 (0.454)
Barium cyanide	A	10 (4.54)
Benzene	A	
Benzoic acid	D	5,000 (2,270)
Benzonitrile	D	5,000 (2,270)
Benzoyl chloride	C	1,000 (454)
Benzyl chloride	B	100 (45.4)
Beryllium chloride	X	1 (0.454)
Beryllium fluoride	X	1 (0.454)
Beryllium nitrate	X	1 (0.454)
Butyl acetate	D	5,000 (2,270)
Butylamine	C	1,000 (454)
n-Butyl phthalate	A	10 (4.54)
Butyric acid	D	5,000 (2,270)
Cadmium acetate	A	10 (4.54)
Cadmium bromide	A	10 (4.54)
Cadmium chloride	A	10 (4.54)
Calcium arsenate	X	1 (0.454)
Calcium arsenite	X	1 (0.454)
Calcium carbide	A	10 (4.54)
Calcium chromate	A	10 (4.54)
Calcium cyanide	A	10 (4.54)
Calcium dodecylbenzenesulfonate	C	1,000 (454)
Calcium hypochlorite	A	10 (4.54)
Captan	A	10 (4.54)
Carbaryl	B	100 (45.4)
Carbofuran	A	10 (4.54)
Carbon disulfide	B	100 (45.4)
Carbon tetrachloride	A	10 (4.54)
Chlordane	X	1 (0.454)
Chlorine	A	10 (4.54)
Chlorobenzene	B	100 (45.4)
Chloroform	A	10 (4.54)
Chlorosulfonic acid	C	1,000 (454)
Chlorpyrifos	X	1 (0.454)
Chromic acetate	C	1,000 (454)
Chromic acid	A	10 (4.54)
Chromic sulfate	C	1,000 (454)
Chromous chloride	C	1,000 (454)
Cobaltous bromide	C	1,000 (454)
Cobaltous formate	C	1,000 (454)
Cobaltous sulfamate	C	1,000 (454)
Coumaphos	A	10 (4.54)
Cresol	B	100 (45.4)
Crotonaldehyde	B	100 (45.4)
Cupric acetate	B	100 (45.4)
Cupric acetoarsenite	X	1 (0.454)
Cupric chloride	A	10 (4.54)
Cupric nitrate	B	100 (45.4)
Cupric oxalate	B	100 (45.4)

Material	Category	RQ in pounds (kg)
Cupric sulfate	A	10 (4.54)
Cupric tartrate	B	100 (45.4)
Cyanogen chloride	A	10 (4.54)
Cyclohexane	C	1,000 (454)
2,4-D Acid	B	100 (45.4)
2,4-D Esters	B	100 (45.4)
DDT	X	1 (0.454)
Diazinon	X	1 (0.454)
Dicamba	C	1,000 (454)
Dichlobenil	B	100 (45.4)
Dichlone	X	1 (0.454)
Dichlorobenzene	B	100 (45.4)
Dichloropropane	C	1,000 (454)
Dichloropropene	B	100 (45.4)
Dichloropropene-Dichloropropane (mixture)	B	100 (45.4)
2,2-Dichloropropionic acid	D	5,000 (2,270)
Dichlorvos	A	10 (4.54)
Dicofol	A	10 (4.54)
Dieldrin	X	1 (0.454)
Diethylamine	B	100 (45.4)
Dimethylamine	C	1,000 (454)
Dinitrobenzene (mixed)	B	100 (45.4)
Dinitrophenol	A	10 (45.4)
Dinitrotoluene	A	10 (4.54)
Diquat	C	1,000 (454)
Disulfoton	X	1 (0.454)
Diuron	B	100 (45.4)
Dodecylbenzenesulfonic acid	C	1,000 (454)
Endosulfan	X	1 (0.454)
Endrin	X	1 (0.454)
Epichlorohydrin	B	100 (45.4)
Ethion	A	10 (4.54)
Ethylbenzene	C	1,000 (454)
thylenediamine	D	5,000 (2,270)
Ethylenediamine-tetraacetic acid (EDTA)	D	5,000 (2,270)
Ethylene dibromide	X	1 (0.454)
Ethylene dichloride	B	100 (45.4)
Ferric ammonium citrate	C	1,000 (454)
Ferric ammonium oxalate	C	1,000 (454)
Ferric chloride	C	1,000 (454)
Ferric fluoride	B	100 (45.4)
Ferric nitrate	C	1,000 (454)
Ferric sulfate	C	1,000 (454)
Ferrous ammonium sulfate	C	1,000 (454)
Ferrous chloride	B	100 (45.4)
Ferrous sulfate	C	1,000 (454)
Formaldehyde	B	100 (45.4)
Formic acid	D	5,000 (2,270)
Fumaric acid	D	5,000 (2,270)
Furfural	D	5,000 (2,270)

Material	Category	RQ in pounds (kg)
Guthion	X	1 (0.454)
Heptachlor	X	1 (0.454)
Hexachlorocyclopentadiene	A	10 (4.54)
Hydrochloric acid	D	5,000 (2,270)
Hydrofluoric acid	B	100 (45.4)
Hydrogen cyanide	A	10 (4.54)
Hydrogen sulfide	B	100 (45.4)
Isoprene	B	100 (45.4)
Isopropanolamine dodecylbenzenesulfonate	C	1,000 (454)
Kepone	X	1 (0.454)
Lead acetate	A	10 (4.54)
Lead arsenate	X	1 (0.454)
Lead chloride	A	10 (4.54)
Lead fluoborate	A	10 (4.54)
Lead fluoride	A	10 (4.54)
Lead iodide	A	10 (4.54)
Lead nitrate	A	10 (4.54)
Lead stearate	A	10 (4.54)
Lead sulfate	A	10 (4.54)
Lead sulfide	A	10 (4.54)
Lead thiocyanate	A	10 (4.54)
Lindane	X	1 (0.454)
Lithium chromate	A	10 (4.54)
Malathion	B	100 (45.4)
Maleic acid	D	5,000 (2,270)
Maleic anhydride	D	5,000 (2,270)
Mercaptodimethur	A	10 (4.54)
Mercuric cyanide	X	1 (0.454)
Mercuric nitrate	A	10 (4.54)
Mercuric sulfate	A	10 (4.54)
Mercuric thiocyanate	A	10 (4.54)
Mercurous nitrate	A	10 (4.54)
Methoxychlor	X	1 (0.454)
Methyl mercaptan	B	100 (45.4)
Methyl methacrylate	C	1,000 (454)
Methyl parathion	B	100 (45.4)
Mevinphos	A	10 (4.54)
Mexacarbate	C	1,000 (454)
Monoethylamine	B	100 (45.4)
Monomethylamine	B	100 (45.4)
Naled	A	10 (4.54)
Naphthalene	B	100 (45.4)
Naphthenic acid	B	100 (45.4)
Nickel ammonium sulfate	B	100 (45.4)
Nickel chloride	B	100 (45.4)
Nickel hydroxide	A	10 (4.54)
Nickel nitrate	B	100 (45.4)
Nickel sulfate	B	100 (45.4)
Nitric acid	C	1,000 (454)

Material	Category	RQ in pounds (kg)	*Material*	Category	RQ in pounds (kg)
Nitrobenzene	C	1,000 (454)	Styrene	C	1,000 (454)
Nitrophenol (mixed)	B	100 (45.4)	Sulfuric acid	C	1,000 (454)
Nitrotoluene	C	1,000 (454)	Sulfur monochloride	C	1,000 (454)
			2,4,5-T acid	C	1,000 (454)
Paraformaldehyde	C	1,000 (454)	2,4,5-T amines	D	5,000 (2,270)
Parathion	A	10 (4.54)	2,4,5-T esters	C	1,000 (454)
Pentachlorophenol	A	10 (4.54)	2,4,5-T salts	C	1,000 (454)
Phenol	C	1,000 (454)			
Phosgene	A	10 (4.54)	TDE	X	1 (0.454)
Phosphoric acid	D	5,000 (2,270)	2,4,5-TP acid	B	100 (45.4)
Phosphorus	X	1 (0.454)	2,4,5-TP acid esters	B	100 (45.4)
Phosphorus oxychloride	C	1,000 (454)	Tetraethyl lead	A	10 (4.54)
Phosphorus pentasulfide	B	100 (45.4)	Tetraethyl pyrophosphate	A	10 (4.54)
Phosphorus trichloride	C	1,000 (454)	Thallium sulfate	B	100 (45.4)
Polychlorinated biphenyls	X	1 (0.454)	Toluene	C	1,000 (454)
Potassium arsenate	X	1 (0.454)	Toxaphene	X	1 (0.454)
Potassium arsenite	X	1 (0.454)	Trichlorfon	B	100 (45.4)
Potassium bichromate	A	10 (4.54)	Trichloroethylene	B	100 (45.4)
Potassium chromate	A	10 (4.54)	Trichlorophenol	A	10 (4.54)
Potassium cyanide	A	10 (4.54)	Triethanolamine dodecylbenzenesulfonate	C	1,000 (454)
Potassium hydroxide	C	1,000 (454)	Triethylamine	D	5,000 (2,270)
Potassium permanganate	B	100 (45.4)	Trimethylamine	B	100 (45.4)
Propargite	A	10 (4.54)			
Propionic Acid	D	5,000 (2,270)	Uranyl acetate	B	100 (45.4)
Propionic anhydride	D	5,000 (2,270)	Uranyl nitrate	B	100 (45.4)
Propylene oxide	B	100 (45.4)			
Pyrethrins	X	1 (0.454)	Vanadium pentoxide	C	1,000 (454)
			Vanadyl sulfate	C	1,000 (454)
Quinoline	D	5,000 (2,270)	Vinyl acetate	D	5,000 (2,270)
			Vinylidene chloride	B	100 (45.4)
Resorcinol	D	5,000 (2,270)			
			Xylene (mixed)	B	100 (45.4)
Selenium oxide	A	10 (4.54)	Xylenol	C	1,000 (454)
Silver nitrate	X	1 (0.454)			
Sodium	A	10 (4.54)	Zinc acetate	C	1,000 (454)
Sodium arsenate	X	1 (0.454)	Zinc ammonium chloride	C	1,000 (454)
Sodium arsenite	X	1 (0.454)	Zinc borate	C	1,000 (454)
Sodium bichromate	A	10 (4.54)	Zinc bromide	C	1,000 (454)
Sodium bifluoride	B	100 (45.4)	Zinc carbonate	C	1,000 (454)
Sodium bisulfite	D	5,000 (2,270)	Zinc chloride	C	1,000 (454)
Sodium chromate	A	10 (4.54)	Zinc cyanide	A	10 (4.54)
Sodium cyanide	A	10 (4.54)	Zinc fluoride	C	1,000 (454)
Sodium dodecylbenzenesulfonate	C	1,000 (454)	Zinc formate	C	1,000 (454)
Sodium fluoride	C	1,000 (454)	Zinc hydrosulfite	C	1,000 (454)
Sodium hydrosulfide	D	5,000 (2,270)	Zinc nitrate	C	1,000 (454)
Sodium hydroxide	C	1,000 (454)	Zinc phenolsulfonate	D	5,000 (2,270)
Sodium hypochlorite	B	100 (45.4)	Zinc phosphide	B	100 (45.4)
Sodium methylate	C	1,000 (454)	Zinc silicofluoride	D	5,000 (2,270)
Sodium nitrite	B	100 (45.4)	Zinc sulfate	C	1,000 (454)
Sodium phosphate, dibasic	D	5,000 (2,270)	Zirconium nitrate	D	5,000 (2,270)
Sodium phosphate, tribasic	D	5,000 (2,270)	Zirconium potassium fluoride	C	1,000 (454)
Sodium selenite	B	100 (45.4)	Zirconium sulfate	D	5,000 (2,270)
Strontium chromate	A	10 (4.54)	Zirconium tetrachloride	D	5,000 (2,270)
Strychnine	A	10 (4.54)			

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18.13. Bridges (Reserved)

18.14. Earthwork and Drainage

The items of work discussed in this section on earthwork and drainage include those construction operations necessary to complete the facility to the top of the subgrade.

The subgrade is considered to be the top surface of the embankment and is the graded surface upon which the subbase, base course, paving, and shoulders will be constructed. In the case of a project involving stage construction, the subgrade may be the top surface required by the contract. Such items as clearing and grubbing, earthwork, culverts and the installation of minor drainage and erosion control structures are usually considered in this category.

18.14.1 Structural Design

The construction of any facility consists of a number of correlated operations, which must be integrated to produce a finished product. Each step has a definite effect on the quality of that product. In any type of construction, the preparation of the foundation is the first and one of the most important stages of the work. In the case of highways or airports, grading and drainage make up the foundation, and regardless of the care taken in succeeding phases of the work, a durable facility cannot be attained if it has an unsatisfactory foundation or is inadequately drained.

The basic concept of structural design is selecting, from preliminary tests, the most suitable available materials and placing them most advantageously. Their grouping in horizontal layers under the surfacing is such that the most benefit will be derived from the inherent qualities of each material. In establishing the depth of each layer, the objective is to provide the minimum thickness that will reduce the unit stress in the next lower layer commensurate with the load-carrying capacity of the material within that layer. Introducing inferior material at a lesser depth than that for which it was designed will upset the equilibrium of such a design. For this reason, field personnel must be constantly alert during construction to guard against the use of material of a lesser quality than that allowed by the plans and specifications.

18.14.2 Preliminary Checking of Plans and Outlining of Work

Prior to the start of work, the project engineer is to review the plans and specifications onsite and to note all conditions, as follows:

1. Note topography, drainage, and the general characteristics of material to be handled.
2. Check borrow and material pits for size, nature, and locations.
3. Check all rights-of-way. Note utility agreements and special agreements regarding both right-of-way and material sites. Do not allow encroachments on private property without permission of the property owner.
4. Note all obstructions within the right-of-way that may interfere with construction. Notify the proper parties of obstructions they must move.
5. Check all drainage and structures.
6. Investigate completely and report to the project manager/group chief any significant conditions that may require a change document.
7. Analyze the Traffic Control Plans (TCPs) for handling traffic during construction. Note any special conditions in the special provisions.
8. Consult airport managers and keep them fully informed of *all* operations. Complete coordination between the airport manager, contractor, and project personnel is essential.
9. Contact The FAA project manager and airport manager concerning runway closures or partial closures and other construction features that may or will result in issuance of a NOTAM (Notice to Airmen). Full cooperation with the FAA is required on all airport projects.

18.14.3 Authority and Duties of Inspectors

Grading and drainage inspectors work under the supervision of the project engineer and are directly responsible to him or her in all matters pertaining to the work. To realize the importance of the duties, the grade inspector needs only to recognize that the greatest portion of embankment failures is due to deficiencies in the subgrade. Inspectors are authorized to inspect all work performed and materials furnished. Such inspection may extend to all or any part of the work. The inspector is not authorized to issue

instructions contrary to the plans and specifications, or to act as foreman for the contractor. The inspector shall notify the project engineer at once of any changes affecting the quality of work or disagreement with the contractor.

The inspector must become familiar with the plans, specifications, special provisions, staking procedures, the Geotechnical Report, the cross-sections, the balance points, and proposed drainage features.

When the inspector is given transportation for maximum coverage of a construction project, it does not mean that inspecting duties can be performed from the vehicle. As an example, it is impossible to check blue tops for base course from a vehicle. The so-called "ride test" will never replace or duplicate work with hand level, cloth tape, and a 10- or 16-foot straightedge.

A grading and drainage inspector's duties are divided into the following classifications:

1. Inspection of clearing and grubbing; excavation of cuts and/or drainage operations; and the construction of embankments
2. Sampling and testing, or notifying the field laboratory technician responsible for the sampling and testing when required
3. Measuring or verifying pay quantities
4. Keeping daily records of work in progress and making required reports; including, if required, a complete, factual, legible diary

18.14.4 SWPPP Requirements

The contractor must have an approved Storm Water Pollution Prevention Plan (SWPPP) and a Notice of Intent (NOI), if one acre or more of ground is disturbed. The contractor may not begin earth disturbing activities until after: the Alaska Department of Environmental Conservation (DEC) has listed the contractor's and the Department's project NOIs as active status on their web site, and the SWPPP Preparer has visited the site and signed a SWPPP Pre-Construction Site Visit (Form 25D-106). For more information on the SWPPP, see Sections 3.11 and 9.9.

18.14.5 Clearing and Grubbing

Complete clearing and grubbing in advance of grading operations in accordance with the specifications. This work consists of clearing the ground within the required limits and materials sites of trees, brush, rubbish, berm piles left from previous construction, and other objectionable material; then grubbing the stumps and larger roots.

No grading is permitted in any area until the clearing and grubbing has been completed to the satisfaction of the engineer. Scattered piles of debris within the usable excavation or embankment area may be easily incorporated in a fast-moving grading job unless the inspector is alert to prevent it.

During the course of construction, ditches, waterways and culverts frequently become clogged or partially filled with debris. The inspector must see that such obstructions are cleared in a satisfactory manner.

Burning

When burning combustible material, the contractor is required to observe all federal, state, and local regulations. Advise the contractor that he or she is responsible for compliance with laws relating to the creating of fire hazards and setting forest fires, including obtaining required burning permits. Pay particular attention to obligations for fire prevention and control. Before burning debris, remove it from areas adjacent to the trees and shrubs selected to remain.

Other Methods of Disposal

Where the specifications allow, areas outside the actual construction limits may be cleared by hydro axing or chipping. Where this is allowed, the debris remains are left on the ground; however, the specifications usually provide for a maximum size allowable and even distribution of debris or chips.

The specifications may require that debris from the clearing and grubbing operations are removed from the project, burned, or otherwise disposed of with the approval of the project engineer. Some contractors tend to dispose of this material by placing it on the abutting property. Permit this only when the contractor will dispose of this material outside of the right-of-way and where the contractor has written permission from the landowner (not the tenant) to use the land and has obtained permits (Army Corps of Engineers). All disposals will be in accordance with the specification requirements for the project.

18.14.6 Earthwork

The operations of excavating borrow and the placing, compacting, and finishing of the excavated material in the embankment or fills are among the most common

operations in our construction work. These operations are practically inseparable, since one operation is rarely carried out without the other, and so we generally consider, inspect, and control them as a single grading operation. The bulk of the grade inspector's duties and responsibilities are the inspection and control of the excavation and embankment work of the grading operation.

Survey Materials Report

Furnish the materials report to the project engineer at the beginning of a project. It is prepared from tests of samples taken from borings or test pits at the time the material survey is made.

Since the design of the facility was based on information from the materials report, make a thorough check of the actual soils encountered while constructing the subgrade. Notify the project engineer if you encounter soils that vary from those shown in the materials report. The project engineer may find it necessary to consult the project manager/group chief or the regional materials engineer. When notifying the regional construction office, the project engineer must make recommendations as to what action should be taken and have all the factual data.

18.14.7 Excavation

Excavation consists of excavating cuts, borrow pits, drainage channels, ditches, etc., for the construction of embankments or waste, in accordance with the requirements of the plans. It includes the removal and disposal of all materials encountered in the excavation, except those items for which direct payment is made separately.

In the event the specifications provide that the contractor will be paid twice for the volume of any materials excavated, stockpiled, and later used in the work, extreme care must be employed in measuring the material.

Unsuitable Material

As a guide, silty soils encountered in excavation with a natural moisture content over 5 percentage points above the optimum moisture as determined by ATM 207, Method D, may be designated as unsuitable material and disposed, at the discretion of the project engineer, unless the contract states otherwise. Use ATM 207, Method D, or ATM 212 to determine maximum densities. In-place field densities will be determined in accordance with ATM 213 and ATM 214.

In the event that the specifications indicate that density requirements will not apply to the portions of embankments constructed that cannot be tested in accordance with ATM 207, Method D, and the specifications require no special rolling requirements, place materials in lifts not exceeding eight inches, or the diameter of the maximum size particle, and route construction equipment uniformly over the entire surface of each layer until embankment does not rut under the loaded hauling equipment.

During the excavation operations, it is necessary at all times to observe the nature of the material encountered. Adverse soils, such as certain silts that exhibit large changes in volume with varying water content, are usually unstable under varying moisture conditions and frost action, and you should use them with discretion. It is essential that you give full consideration to making the best possible use of the soil material encountered in the excavation. However, you should avoid the use of soils that may cause instability in the embankment, or that may have some other detrimental effect, unless adequately treated to make them satisfactory. Soils, which are unsuitable in the upper portions of the subgrade, may often be used in the bottom or center of the embankment mass where their detrimental effects will be minimized. Recommendations on use of those materials should come from the designer or regional materials engineer and be documented.

Remove unsuitable material and replace it with acceptable material as provided in the specifications. Field tests documenting that the materials are unsuitable for use in embankments will be required for all wasted excavation.

It is the intent of the specifications that all usable excavation be placed in the embankment. Contract plans usually include quantities of unsuitable material to be wasted from excavation sections. Materials, which are usually designated as waste on the plans, are peat and muck, soils with a high percentage of vegetable matter, or silts and clays with high natural moisture content. The quantities shown on the plans as waste reflect only the best estimate, which the design sections are able to make on the basis of available materials reports and their knowledge of moisture conditions, which may be anticipated during the construction period. Estimates are based on a limited number of borings judged to be representative of the area. During construction, there may be considerable variation in the required depths of stripping or in the

extent of pockets of unsuitable materials, such as muck or peat. Further, variations in moisture content throughout a season or even in a matter of hours may have a substantial effect on certain materials and may make the difference as to whether they can be used or must be wasted. Under such circumstances, it is scarcely reasonable to expect the designer to include firm estimates of such quantities in the plans.

In many instances, the decision on whether or not this material must be removed is obvious regardless of whether the quantities conform to the plan estimate. However, in many other instances the decision is not so obvious due to the basic borderline nature of the material or as a result of the variations in moisture content. The decision on whether the material will be used or wasted must be made at the site with full knowledge of all the facts on its suitability for use in the embankment, the length of haul, and the cost of replacement with suitable borrow material.

When variations from plan quantities are rather minor and the distinction between usable material and waste is readily apparent, it is anticipated that the decision to waste or use will be made at the project level. When it is evident that a large quantity of excavated material intended for use as embankment must be wasted, a change document might be necessary to adjust the unit price, and the project engineer should immediately notify the project manager/group chief. Project engineers and inspectors do not have authority to order large quantities of waste not contemplated on the plans. When you must make extensive changes or when you encounter unusual soil conditions, consult the regional office at the earliest possible time so that you can consider methods to eliminate the waste.

In all cases where overruns in waste occur, document the overruns in the inspector's daily report and sample and test to establish the classification and moisture content of the material being wasted: a minimum of one gradation, P.I., and moisture content per undesignated waste cut. See the Material Sampling & Testing Frequency tables in sections 18.8 and 18.9.

The specifications require the use of useable excavation before placing borrow. There are occasional instances where it is advantageous to waste good material. Such an occurrence might result when the distance from the excavation to the embankment is so great that the additional haul would cause such material to be more expensive than wasting and substituting borrow from a nearer source.

Undercutting and Over-excavating

The following applies to projects where payment is other than to neat line as shown on the plans.

The specifications do not allow payment for materials excavated beyond the limits of the required slopes, except in certain cases. The inspector must continually inspect the construction of all slopes and ditches. If at any time the contractor excavates outside the slope stakes or below subgrade, except as required on the plans or as directed by the project engineer, or if the contractor over-excavates the slopes, or by methods of operation cause overbreak, the project engineer will immediately notify them that the specifications and contract do not permit payment for such excavation.

Where contractors excavate below subgrade, except as required on the plans or directed by the project engineer, they will replace the excavated material with a material of equal or better quality at their own expense. Before the work is accepted, the facility shall be substantially true to line, grade, and section shown on the plans.

Blasting

Overshooting of rock may shatter the adjacent hillside far behind the backslope, causing subsequent slides and over-breakage. Powder work is highly specialized, more an art than a science, and few, if any Department personnel have the knowledge and expertise required to actually criticize a contractor's drilling and shooting operations. Project personnel must be extremely careful to avoid any action that can be construed as assuming responsibility for the management of the contractor's operations. The contractor is required to have a licensed Powderman with a certificate of fitness for explosive handlers.

Project personnel can obtain copies of the "Blaster's Handbook" and familiarize themselves with the rules, regulations, properties, uses, and action of explosives. Before drilling, the contractor must furnish the project engineer with a blasting plan. The plan shows the pattern and depth of drill holes, type and amount of explosives used, loading pattern and sequence of firing. See Exhibit A for Sample Blasting Notes.

If the contractor's operation is not producing the desired results and the contractor appears to be making no effort to change, the project engineer will notify the contractor in writing, specifying what the problem is, that there appears to be no attempt at correction forthcoming, and that overbreak and slides

due to overshooting, which is usually the problem, will be at the contractor's expense.

Safety is primarily the contractor's responsibility but project personnel on projects requiring powder work should secure and become familiar with all applicable federal and state laws and regulations governing the storage, transportation, and use of explosives. The Powderman is responsible for all activities of employees within the blasting area and within 100 feet of the blasting area. The Powderman controls access by employees to this area. Employees may not enter the area until the Powderman gives the clearance to do so.

Particular care must be taken to ensure that there is no drilling behind the backslopes. However, drilling below grade is common practice to ensure that no points of rock are left sticking up between drill holes. The specifications recognize this and may provide for payment for excavation and backfill below plan grade.

Overbreak and Slides

The specifications may provide for payment of overbreak due to blasting operations. If excessive overbreak is occurring, the project engineer should proceed as outlined in Section 18.14.7, Unsuitable Material.

Excess Material

Excess required unclassified excavation should be used to the state's best advantage uniformly within the right-of-way limits, unless other methods are provided in the contract.

18.14.8 Borrow

In addition to the usable unclassified excavation, borrow is material required for embankments or other portions of the work, which is normally obtained from outside the project limits.

Although the specifications provide that the contractor may furnish material from sources of his or her choice, borrow sources require approval by the project engineer and must meet gradation and liquid limits requirements. Approval should be in writing.

Do not place borrow in an embankment until all usable excavation has been utilized as provided for in the plans.

Approval of Borrow Pits

When material sources are designated on the plans, no additional approval is required. A designated source does not guarantee acceptance of all the material in the pit. The contractor may use the source as long as the material continues to satisfy the requirements indicated in the contract. The project engineer may reject portions of the deposit as unacceptable or may reject any material produced from a designated source that does not meet the specification requirements.

When the contractor wants to use sources other than those included on the plans, he or she may use the material only after samples prove the material is acceptable, and the project engineer gives written approval. The contractor and the project engineer should clearly understand that approval of a contractor-furnished source in no way relieves the contractor of his responsibility for furnishing material meeting the specifications.

Quality

Materials produced at the site by the contractor must meet various standards of quality. You should request that the contractor furnish the location of the sources of these materials well in advance of production so that it will not cause a delay because of the time involved in testing. See the Materials Sampling & Testing Frequency tables in sections 18.8 and 18.9 for materials with quality requirements.

Pit Stripping

In the event that borrow pit clearing and/or stripping is required, it is important that the project engineers familiarize themselves with all of the pertinent requirements of the plans, specifications, special provisions, pit agreements, and environmental concerns, as well as the information available in the materials investigation report.

If the contract includes pit clearing and/or stripping as pay items, it is important that only those portions of the pits be staked that are needed to satisfy the quantity requirements of the project, keeping in mind adequate provisions for sloping, working floor space, and access to and from the pit area. A pit development plan may be required under the contract.

Because of the usual difference in unit prices between the cost of pit stripping and the cost of the borrow material, exercise care in determining stripping limits.

Haul Roads

Locate haul roads so that a minimum of haul, if haul is a contract pay item, will be required. In the normal instance where material will be hauled in two directions from the junction with the facility, a haul road with right angles to centerline is satisfactory. However, such factors as terrain, soil conditions, drainage, and the necessity for preserving natural vegetative cover must be taken into consideration. Check right-of-way plans and pit agreements to ensure that you have obtained the right to use the proposed location. In no instance should you allow the contractor to haul across private property without the written permission of the owner.

18.14.9 Embankment

The end results of the grading operation are a completed embankment having a high stability and density. The specifications include general requirements with respect to preparation work for the embankment construction. These requirements include suitability of materials, the use or disposal of unsuitable materials, requirements for benching existing side hill slopes, use of frozen material, and construction of embankments on existing surfacing. The grade inspector should be thoroughly familiar with these requirements and should be certain that the grade foreman is also familiar with them.

The grade inspector will inspect the contractor's operations and procedures, as necessary, to obtain stability and the density specified. The inspection and control necessary will vary considerably depending on the requirements specified, the type of soil and ease of compaction, the moisture control necessary, weather conditions, the skill of the contractor's forces, numbers and types of equipment, and other factors. Density tests are an aid to and a verification of the proper compaction of the finished embankment.

Experience shows that despite good grading operations and proper compactive effort in the construction of embankments, there are a number of items that, if not carefully observed and specifically inspected, may result in settlement. These special attention areas are as follows:

1. Settlement or sideslip may result on existing fill slopes or side hills if the original ground is not properly benched. Give careful inspection to the matter of benching side hill slopes and existing embankment slopes to be widened, as indicated in the plans and specifications.
2. Settlement may result at cut-to-fill transitions due to fill taper and insufficient compaction in the natural ground at the beginning of the fill. Give particular attention to the compaction of the new embankment at these points during the course of construction.
3. Settlement in areas adjacent to or over structures frequently occurs. Probably the most important inspection feature in this connection is the proper placement and compaction of material in the areas inaccessible to rollers, and the compactive effort of the earth-moving equipment. In most cases, you can eliminate this by close inspection of compaction by small mechanical tampers.
4. Compact backfills at bridge abutments, wings, and retaining walls carefully. Step the slope of the existing ground to prevent wedging against the wall. Use material that will compact readily, if available. Do not use silty soil. During backfill operations, check possible displacement of wing or abutment walls as the backfill progresses.
5. The grade inspector should be alert to possible damage to any drainage structure, which the contractor's heavy equipment may cross or work over, and particularly to possible damage to pipe culverts with minimum fill heights over the structure.

The grade inspector must insist on the construction of slopes conforming to the typical cross section. Encourage the contractor to maintain adequate surface crown during construction to facilitate proper drainage. Note actual limits of haul from each source in the daily diary, and report (if required), as well as any cross haul.

On some projects, you may encounter major shortages or overages in the quantity of excavated material available to construct the embankments. The proper solution of such problems will vary depending on the cause of the excess or shortage of material. Revising the grade lines, rebalancing, or obtaining additional material outside construction limits or balance points shown on the plans may involve additional haul with problems and measurements incidental thereto. Accordingly, if you encounter more than minor shortage or excess of excavation material, contact the project engineer for instruction. Any significant changes in the plans to correct for shortage or excess of excavation may require a change document.

Uniform Density

Compaction directly affects supporting power of soils. The lower the compaction, the lower the supporting power at any given moisture content. Improperly compacted embankments will consolidate non-uniformly under traffic, resulting in an uneven surface. Soils vary widely in the amount of compactive effort necessary to reach a common degree of compaction.

Take care to obtain uniform density throughout each fill rather than to have some areas compacted in excess of the density requirements while others are below requirements. Encourage full width embankment construction where possible. This will ensure more uniform density; it is essential that the moisture content be uniform. In most cases, the required density can be obtained with the least effort if the moisture content is close to the optimum obtained by the standard moisture density test.

Layer Method

The specifications state that embankment must be placed in horizontal layers not to exceed eight inches, except when the excavated material consists predominately of rock fragments or boulders of such size that the material cannot be placed in layers of the thickness prescribed without crushing, pulverizing, or further breaking down the pieces resulting from the excavation or when the initial lift of embankment is to be placed over swampy or saturated ground. When the layer method is employed, the prescribed thickness (loose measurement) of the material should be placed in horizontal layers and compacted as specified prior to placement of each succeeding layer. Material of such size that it cannot be placed in layers of the thickness prescribed may be placed in the embankment in layers not exceeding in thickness the approximate average size of the larger rocks. The thicker lifts shall not be constructed above an elevation two feet below the finished subgrade. However, the contractor is permitted to end dump an initial lift of material of sufficient depth to support hauling equipment when embankments are to be placed over swampy or saturated ground.

Density Control Method

The contract will show any areas and the distance below subgrade to which moisture and density control will apply. Where it is necessary to add water for compaction, this may be done either in the cut, borrow pit, or on the fill.

In general, the moisture content required for compaction should approximate the optimum obtained by laboratory tests. However, the construction optimum moisture content for any given soil is not necessarily the same as the laboratory optimum but will vary from it within a small range, depending on the type and weight of the compacting equipment and the method of operation.

Materials having a high percentage of fines are susceptible to over-watering. Avoid such over-watering. When the soil voids are completely filled with moisture, no more compaction is possible by rolling. The pore pressure instead of the soil is supporting the roller and quaking or rubbery action under the roller is evident. Unless corrected by draining or drying, this quaking will be reflected through the base material courses and it will not be possible to properly compact the base material. No lift may be covered by another until the required compaction is obtained.

Using Oversize Rock

Do not permit gouging or digging of holes in the original ground surface or in any layers of the embankment for the purpose of disposing of large boulders. Dispose of them to the satisfaction of the project engineer.

Compaction Equipment

The choice of compaction equipment is normally left to the contractor unless otherwise stipulated in the specifications.

In general, heavy steel rollers will be best for cohesive soils, while the pneumatic rollers and vibratory compactors will work better on sand and gravel-type materials of low plasticity. Grid rollers have been found to be advantageous in broken rock.

Proper routing of the contractor's hauling equipment over the fill area is another essential operation in obtaining uniformity in the compacted area. One of the main difficulties the inspector will encounter in constructing embankments will be that the rate of placing material in the fill area may far exceed the compaction capacity of the contractor's equipment. In this case, the project engineer will require a decrease in the amount of hauling equipment or an increase in the amount of compaction equipment to ensure that each layer is satisfactorily compacted before any material for the succeeding layer is placed.

Density Testing

Determine maximum densities using ATM 207, Method D, or ATM 212. Determine in-place field densities in accordance with ATM 213 and ATM 214. Test adjacent to structures and at random locations throughout the embankment area in each layer sufficiently often to ensure that adequate compaction at all points is being achieved. In coarse material where it is not practical to make density tests, compaction will be obtained as stipulated in the specifications. In such material the grade inspector will have to verify that the compaction meets the requirements of the specifications.

18.14.10 Fine Grading

Finish the surface in conformity with the grades shown in the plans and within the tolerances shown in the specifications. The shoulder lines and slopes should be true and ditches should be finished to a grade that will drain.

The project engineer should keep the contractor advised about cleanup that must be performed as work progresses. In advance of finish grading operations, the project engineer should go over the work in detail and furnish the contractor with a written list of items of work requiring corrective action. The contractor is entitled to this information in advance in order to plan and efficiently carry out the remaining work.

Encourage the contractor to progressively finish sections of the project. This procedure expedites completion of the whole project and facilitates the taking of final measurements and computations.

18.14.11 Haul

Haul is not an item of work that requires inspection to maintain a standard of quality. This does not mean that the inspector or the project engineer can neglect this item. The balance point as indicated on the plans represent the most economical haul for the state computed from theoretical swell or shrinkage factors. Keep accurate records of the field balance points, distribution of borrow, and authorized or unauthorized cross haul during construction so that the actual distribution of the excavation and borrow material is known.

The inspector must carefully check the balancing of excavation quantities as the work proceeds to check the shrinkage or swell factors used in preparing the balance points on the plans. Should the balance point on the plans be a considerable distance from the actual construction balance point, a change in the shrinkage or swell factor is likely. A substantial change in the shrinkage or swell factors indicates that a change in plans may be necessary to avoid wasting excavated material or an overrun of borrow. Any substantial change in shrinkage or swell factors must be referred to the project engineer, who may consult with the project manager/group chief about the proper action.

18.14.12 Drainage

Water, either directly or as a contributory factor, is often the cause of embankment failures. It is therefore essential that all work involving drainage be carried out carefully and accurately and in such a way that the design features are not impaired in construction, yet the flow lines and other features satisfactorily fit field conditions.

Cut Section

In cut sections, construct ditches to such grade that there will be no impounding of water. This may require ditch grades, which are independent of the embankment grade or a special ditch.

Furrow Ditches

A properly placed furrow ditch need not always parallel the centerline or grade line of the embankment. The ideal would be a ditch following the contour of the land with 0.5 to 1 percent grade, but right-of-way considerations normally prevent this. It is therefore considered good engineering practice to study each case to prevent erosion. Where considerable surface drainage over the top of high cuts appears likely, the construction of ditches above the cut to lead the flow to natural drainage courses shall be far enough away from the edge of the back slope to prevent seepage, which could cause sliding; and ditch grades should not be so steep as to cause erosion.

Inlet and Outlet Channels

Construct inlet and outlet channels to culverts as shown on the plans, of ample size and shape to take the maximum flow. If practical, make them prior to or at the time the culvert trench is being excavated. They must present a neat and workmanlike appearance upon completion and be open and ready for operation upon completion of the adjacent structure. Check adjacent side ditches to be sure they drain toward the culverts or toward the natural drainage outlets.

Channel Changes

Construct channel changes to the line, grade, and dimension shown on the plans. Complete channel changes to direct the flow into structures by the time the structure is completed. Construct channel changes to direct drainage flow away from the embankment section before completion of the embankment to protect the new construction work.

Underdrain

This work consists of constructing underdrains using the type and size of pipe and granular material in accordance with the specifications and in conformity with the lines and grades shown on the plans or otherwise established by the project engineer. The inspector should know and understand the specifications and special detail drawings for the type of underdrain to be constructed.

Underdrains are placed to lower a high water table or to intercept and dispose of water seeping into the embankment from sources outside of the embankment. The location of underdrains is usually determined by soils investigations previous to completion of the plans, but may be changed or added to during grading operations. The project engineer should make any significant changes in design location or the selection of additional locations and document it in writing with the appropriate contractual document.

Place perforated pipe with their perforations down except when their only purpose is to transport water. When their purpose is to carry water only, use a pipe without perforations and place granular material around the pipe. If you install blind drains, omit the pipe, and lower the water table using free draining material.

Rigid inspection is required during construction of all types of underdrains. This ensures that any slides from the sides of the trench are removed to ensure the filtering action of the granular backfill and that the holes in the underdrain pipe are not clogged with foreign material, which would prevent the drain from functioning properly.

If equipment must cross underdrains after installation, the inspector must insist on adequate covering to protect the pipe from crushing and the granular material from contamination.

The inspector should record the accepted quantity and location of all underdrains and should verify that all required tests and certificates of compliance are in the project record.

18.14.13 Minor Drainage Structures

Minor drainage structures are those of less than 20-foot span, including culverts, sewers, manholes, catch basins, and inlets. Prior to the contractor starting work on a structure, review the plans and designated stationing of structures at their respective sites to ensure that they are properly located. Bring any changes, additions, or deletions to the contractor's attention as early as possible.

Inspect all material prior to incorporating it into the work. The inspector must also ensure that all materials have been approved for use in the work and that all the required certifications have been received.

Before the contractor begins the construction of the structure foundation, the inspector should inspect the soil conditions. The foundation material should be firm and relatively dry for proper support of the structure. Walls of structures should be constructed plumb, unless otherwise indicated on the plans, and the dimensions of the structures must conform to that required by the plans.

Pay careful attention to the backfilling operations to be sure that no damage occurs to the structure, and also to be sure that backfill material is properly compacted. Place and compact material in level layers around the structure.

Carefully adjust any required grate or cover for masonry or structural concrete structures to the line and elevation required and supported as shown in the plans and specifications.

Structural Excavation

If structural excavation is a pay item, the specifications will set the limits of structural excavation, which shall be measured for payment. Documentation of the quantities submitted for payment shall consist of cross sections taken prior to beginning of the excavation, upon completion of the excavation, and at the top of any bedding material that may be required immediately prior to laying the pipe. Review contract specifications for any special methods of measurement.

Foundation for Structures

It is essential that the foundation under a structure provide support as firm and as nearly uniform as

possible under the entire bearing surface. Whenever conditions permit, the bottom of the excavation should be on undisturbed ground for its full length and width. If you can avoid it, do not place culverts partly on filled ground and partly on undisturbed natural ground because of the probability of unequal settlement, which might distort or break the structure. This applies transversely as well as longitudinally and, when you use a side hill location, bench the culvert into the hillside far enough to be entirely on solid ground. If part of the culvert must be on filled ground, place the filled material in thin, thoroughly compacted layers, so it will provide a foundation as comparable to the natural ground as possible.

Avoid the installation of drainage structures or systems in embankments, or constructed on unstable foundation material. This reduces the possibility of providing a foundation subject to settlement, which could cause breakage of the structure, or low spots that do not drain. When you must make such an installation, construct and thoroughly compact the embankment to the elevation indicated on the plans. Then, make the excavation in the compacted fill.

Remove unstable foundation material other than massive deposits of permafrost or muskeg and replace it with satisfactory bedding material to the extent practicable. Place a layer of sand, gravel, or other suitable material on the unstable material until a stable foundation is formed. If placing a pipe culvert in rock excavation, remove the rock at least six inches below the bottom of the pipe and then place a well-compacted cushion of gravel, sand, or other suitable material as a bed for the pipe. When using bell and spigot-type pipe, excavate holes to fit the bells so that the pipe will have uniform bearing throughout its length, rather than resting on the bells.

Consider cambering of a culvert grade line before starting installation of the pipe. Subsidence varies widely depending on the fill height, the depth to a solid stratum, and the compressible character of the foundation site. Do not use camber as a substitute for foundation stabilization. Correct a poor foundation before installing culverts. Base the amount of camber on the foundation soil profile stabilization.

In areas of extensive permafrost, innumerable variables and their unique combinations must be considered in approaching the problem of adequate foundation conditions. In most instances, the plans and specifications will provide construction requirements to be followed. In the event that an isolated installation in permafrost has been overlooked and no plan or specification procedure is indicated, do the foundation work so it will least disturb the thermal balance of the foundation. To upset the thermal balance will set up a condition of unequal subsidence that would create a maintenance problem for some time. If doubt exists about proper and adequate procedure, consult with the project manager/group chief or regional materials section for recommendations.

In the event of an isolated installation in a muskeg area, it is good to follow the procedure established for foundation treatment of the immediate embankment area. This will more nearly ensure uniform subsidence and continued functional ability of the structure. If the muskeg in the immediate embankment area is being removed to suitable foundation materials, then follow the same procedure at the structure site. On the other hand, if the muskeg material in the immediate embankment area is to be loaded either by the normal fill or a rolling or static surcharge, then treat the foundation material at the structure site in the same manner. In either case, it is best to maintain the maximum feasible camber.

Pipe Culvert

Where practicable, construct pipe culverts before beginning the fill in the adjacent section. A properly placed culvert should have a flowline gradient the same as that of the stream channel in which it is placed and on approximately the same alignment. However, the elevation of the flowline of the culvert should be low enough that water is not impounded above the embankment. In the event that a culvert is to be added during construction, give special attention to inlet and outlet ends with respect to their abilities to withstand the variable forces exerted during times of above-average flow. This is especially true with respect to structures 48” and greater in diameter, which require headwalls, riprap, or end sections to protect the structure.

Since culvert conduit is manufactured off the project site, testing on the project is not normally required. However, do not install and pay for culverts until you have received an approved certification verifying the quality of the pipe. Test the quality and compaction of the backfill and bedding material in accordance with instructions as outlined in the Materials Sampling & Testing Frequency tables in sections 18.8 and 18.9.

Camber in the grade under high fills, or on a foundation that may settle, should be considered in base preparation. Camber is simply a rise at the center of a culvert above a straight line connecting its ends. The objective is to shape and/or elevate the grade to ensure a proper flowline after settlement takes place. This forethought will prevent a sag in the middle of the culvert that might pocket water or reduce capacity because of sedimentation. Generally, you can obtain enough camber by placing the base for the upstream half of the pipe on an almost flat grade and the downstream half on a steeper-than-normal grade. The greater load at center of the embankment, and the corresponding settlement, will result in the desired positive slope after full consolidation. Soils engineering techniques are available to predict the amount of camber required for unusual conditions. It is usually possible to obtain camber equal to a minimum of one-half of 1 percent of the length of the culvert without special fittings.

When installing pipe culverts, the inspector must:

1. Check the location for proper size, length, camber, skew, and flow line elevation.
2. Check the foundation, and if the underlying material is unsuitable, remove, replace, and compact with suitable bedding material.
3. Check for the pipe being laid to the correct line and grade.
4. Check to see that the pipe is placed with the outside seams pointing upgrade and coupling bands and end sections are properly installed. Coupling band bolts should be at the side.
5. The backfill should be brought up equally on both sides of the pipe. See that each successive layer is thoroughly compacted and the required density achieved for each layer.
6. Check the plans for any required strutting or shoring details for large pipes. When shop strutting of the pipe is called for, no additional vertical diameter elongation is required in the field. However, the struts must conform to the plan details.
7. Remember to stake the pipe according to the horizontal distance from the centerline while measuring the length of pipe along the slope distance. Note that on steep hillside slopes there is considerable difference in the two lengths.
8. Note any special requirements relating to the passage of fish. Culverts in streams may require permits from the Alaska Department of Fish and Game, the Alaska Department of Environmental Conservation, and/or the Army Corps of Engineers. Although permits are usually acquired in the design phase, if you have any questions about the need for a permit or about permit stipulations, check with the Environmental Section to determine the need for permits.

When installing the structural plate pipes, the inspector should ensure that the erection plan furnished by the fabricator is followed. For ease in erection, do not tighten bolts until all plates are in place. Check the plate pattern for conformance with the manufacturer's erection diagrams.

The inspector must also check the installation of culvert thaw pipes or wire to ensure that they are installed according to the plans and specifications. After installing the thaw pipe, thoroughly flush it with water.

Backfilling

Settlements in fill adjacent to or over structures is one of the more frequent causes of uneven surfaces. Backfill material should be the best available so that uniform bearing may be provided. Granular material is preferable. In any event, the material should be free from muck, large stones, lumps, and rubbish. To obtain uniform pressure against the pipe or structure, place the backfill material in layers about six inches thick and thoroughly compacted. Add water if necessary to bring the material to the optimum moisture content for maximum consolidation. To avoid displacing or unduly stressing the structure, backfill on both sides simultaneously.

In the case of pipe culverts, there should be a berm of compacted material on each side of the pipe as shown in the plans. The compacted backfill should extend at least eight inches and preferably a distance of two diameters above the top of the pipe. Give special care to tamping material under the haunches of pipes. Excessive compaction under the haunches will raise the pipe above intended grade.

Density tests shall be as required. Material with low density must receive additional compactive effort; if it cannot be compacted, remove it and replace it with material that can be compacted. Deposit the backfill for trenches and other small areas and compact it in thin layers. Use hand tampers or mechanical tampers.

Do not allow the use of backfilling by tractors and bulldozers, special backfilling attachments for tractors and power shovels, or other equipment, or compacting by rollers next to the pipe wall because of the probability of damage to the pipe. Adequately protect pipe culverts and other structures from damage before operating any heavy equipment near or over them.

You can sometimes use water to facilitate the settlement of granular backfills but never use it where conditions are such that liquid or semiliquid pressure may develop within the berm area or where prohibited by the specifications.

18.14.14 Curb and Gutter and Sidewalk

This work consists of constructing bituminous concrete or Portland cement concrete curbs, curb and gutter, or sidewalks in accordance with the specifications and in conformity with the lines and grades shown on the plans.

The inspector must understand the specifications for the type of curb and gutter or sidewalk to be constructed. The location should be staked and checked well in advance of the work.

Usually, both sidewalks and curb and gutter are constructed on a bed of specified material that has been compacted to specification requirements.

Concrete and bituminous material must meet the requirements of the specifications. All material specified to be tested must meet testing requirements before being incorporated into the work.

Bituminous sidewalks are normally constructed in one layer and compacted with a sidewalk roller where feasible or hand tamped in places inaccessible to the roller. When constructing sidewalks adjacent to curbing, take care that you do not damage or discolor the curb. Wherever possible, the new sidewalk grade should meet existing driveway or walkway grades.

Bituminous curbs are normally constructed with a special curb machine. Portland cement concrete sidewalk or curb and gutter forms should be strongly constructed and braced so that you maintain proper alignment and grade. Before placing Portland cement concrete, moisten the bedding material thoroughly so it will not absorb an excessive amount of moisture from the fresh concrete. Joint spacing, joint material, and reinforcing steel, if required, will be shown on the plans.

Proportioning of the Portland cement concrete mix and the method of finishing and edging are outlined in the specifications. It is the duty of the inspector to see that these requirements are carried out. Usually the contractor has a choice of several methods of curing the concrete. After the method of curing is selected and approved, the requirements for the specific method must be carried out. This may require bridges for pedestrians or vehicles during the construction and curing periods to protect the sidewalk or curb and gutter.

When the material is being placed, the inspector must:

1. Check the plans, specifications, and special provisions to make sure that all construction requirements are clearly understood
2. Check the staking for alignment and grade
3. Check forms for strength and adequacy. Be sure they are braced; fresh concrete exerts unbelievable pressures
4. Check the forms for location, alignment, and grade. After checking with the instrument, tape, etc., be sure to “eyeball” the forms by sighting both ways along them at frequent intervals. This will pick up minor irregularities that cannot be found any other way.
5. Check bedding
6. Check mixing and placing of material
7. Check type and location of joints
8. Check finishing
9. Make sure all required sampling and testing is performed
10. Check curing of Portland cement concrete
11. Record all required measurements and data in the field book

18.14.15 Beam Type Guardrail

This work consists of the construction of beam type guardrail. The inspector should keep in mind that the guardrail is constantly in the eyes of the public and the finished rail must present a suitable appearance. The inspector should have full knowledge of the specifications and detail drawings, including shop drawings, curved rail elements to fit specified radii. If the inspector is not around during the guardrail

installation, he or she will not know how many posts were cut short due to hitting rocks.

Review the proposed location of the guardrail as staked to ascertain that it is properly placed to prevent the possibility of a vehicle running behind it into a hazard zone. Changes should be made only when authorized by the project engineer.

Using the centerline or pavement edge to align the guardrail posts. Before driving or drilling posts, make sure there are no underground utilities or culverts that may be damaged at post locations. Generally, the holes for the posts are auger dug, although metal posts are punched with a mandrel. After the placing the posts in the holes, backfill and compact them as specified. Posts should be set plumb and spaced at the specified intervals with the tops of the posts set to the design elevation. Check rail elements for proper height and the overlapping of joints with the direction of vehicular traffic.

Materials are manufactured off the site and are normally inspected before arrival on the project. However, the inspector must verify that the required test certification indicating compliance with the specifications are available prior to installation. He or she should further ascertain that the materials have not been damaged subsequent to testing. The accepted lengths and locations of the guardrail sections should be recorded in the project files.

18.14.16 Fences

Fencing items consist of the furnishing and erection of woven wire, barbed wire, chain link fabric fences, and gates in conformity with the specifications and detail drawings.

Inspectors must familiarize themselves with all specifications and drawings. Staking is the contractor's responsibility. The inspector should review all proposed locations and if changes either in location or type of fence are desirable, should obtain the approval of the project engineer for such changes and furnish the contractor with a revised list.

The inspector should inspect the installation or erection of all items of fencing to ensure that the posts are erected true to line; that the wire, fabric, and hardware is attached to the posts in the proper manner and at the proper elevation with the wire installed on the specified side; and make sure the posts are firmly installed.

The inspector must record the accepted quantity for the types of fences and gates installed. Measurement for payment shall be as stated in the specifications. The inspector must verify that required materials test indicating compliance with specifications is available prior to installation.

18.14.17 Riprap

When required, place riprap as soon as feasible after the construction of embankments, dikes, or channels. Where possible, finish the embankment, dike, or channel slopes to a smooth line before placing riprap. When stream conditions require that the riprap be placed in conjunction with the construction of embankments of dikes, the inspector should take particular care to ensure the placement of the proper thickness of riprap.

To avoid any delay in the contractor's work due to the time involved in testing the quality of rock for riprap, the project engineer should require the contractor to provide the location of his riprap source well in advance of the date he intends to start placing riprap. The gradation of the riprap, when required, and the method of determining that gradation shall be as called for in the specifications or special provisions.

18.14.18 Contractor Furnished Surveying

Check the contract for any special provisions modifying the Construction Surveying and Monuments Section 642 of the Standard Specifications for Highway Construction and the Airport Contract for any Special Provisions modifying contractor-furnished surveying.

The surveyor must be a registered Professional Land Surveyor, currently registered in the State of Alaska, and shall follow the Alaska Construction Surveying Requirements (U.S. Customary Units or Metric) in the specifications.

The project engineer or the representative will randomly spot-check the contractor's surveys, staking, and computations. The contractor will provide the project engineer notice prior to performing any work, and will furnish the appropriate data as required, to allow for such random spot-checking. The Department assumes no responsibility for the accuracy of the work.

18.15. Surveying and Staking

18.15.1 General

Use this section as a reference of acceptable procedures for consultant or contractor forces performing construction surveys. Perform construction surveying to industry standards. An Alaska-registered Professional Land Surveyor shall install the monuments.

This section is not a substitute for a textbook or handbook on surveying. Party chiefs, instrument-men, and other personnel shall be competent surveyors and have the necessary tables, handbooks, and other references.

This section will provide the standard methods of staking used on construction projects. The contractor performs the construction surveys and provides the Project Engineer with the surveying data.

Employ surveying techniques that will provide a minimum of confusion, a maximum of economy, and documentation to substantiate quantities of material. The documentation provides a reproducible audit trail. Establish centerlines, right-of-way monuments, and benchmarks to the required limits of accuracy in the Alaska Construction Surveying Requirements (US Customary Units or Metric). Construction survey personnel assigned to the work shall be familiar with efficient methods of staking.

Construction surveys provide for the setting of construction stakes, establishing lines, slopes and continuous profile-grade for grading work, and centerline and benchmarks for structure work, culvert work, protective and accessory structures, and appurtenances as necessary. These stakes and marks constitute the field control with which the contractor performs the work.

The Project Engineer will provide the contractor sufficient horizontal and vertical control data to enable the contractor to establish the planned lines, grades, shapes, and structures. The preconstruction survey may have established this control. The control data should be checked and if necessary, provide additional baseline points or benchmarks.

On projects, which require considerable staking, the surveyor should begin staking as far in advance of the beginning of construction operations as weather and soil conditions will permit. Maintain staking in advance of the contractor's operations and requirements. Check the message and possible displacement of stakes that stand over the winter before use. Recheck all benchmarks, temporary benchmarks, and other primary control before use after a winter layover.

The contractor shall assign sufficient qualified personnel to perform the required surveying and staking.

18.15.2 Field Notes

Record all field notes in standard bound field notebooks furnished by the Department. They are permanent source documents. Persons with varied professional backgrounds may refer to these notebooks. Notes will be neat, legible, precise, and sufficiently detailed to convey their intent to anyone not familiar with the project.

Erasures of errors in field notes are not acceptable. A line drawn through those portions of notes in error (leaving the original note legible) with corrections noted directly above and initialed where quantity measurements are involved is the rule. Include a note of explanation with initials.

Identify all field notebooks on the outside of the front cover indicating content, project number, station limits and year. Index each book and its contents with page numbers. Place page numbers in the upper right hand corner of each page. Show the date, weather condition, and party personnel at the beginning of each day's notes. As a rule, place field notes for each phase of the work in a separate series of field books. Sometimes, it is feasible to combine minor items into one or more "Miscellaneous" books.

18.15.3 Construction Centerline

The first survey work on a project is usually the establishment of the construction centerline. This line conforms to the construction centerline shown on the plans, which may or may not be the existing survey line. Correct any errors found in line and show on the plans with reference to the plan centerline.

The chief of party or his designated representative prepares the alignment book. Conduct a thorough field review before actual staking. The construction centerline is marked by witness stakes driven on the line behind the point of beginning, with the station and plus station facing the zero station of the survey. If the line traverses a traveled way, centerline points are referenced at right angles with the station and plus station and the distance right or left marked on the

side of the stake facing centerline. After reproducing the centerline, reference the control points at the beginning and end of curves, points of intersection, points on tangents at approximately 1,000-foot intervals, and points on long curves where visibility is restricted. It is good practice to reference often enough so that each point will see at least one other reference point ahead and back.

Reference control points per the Alaska Construction Surveying Requirements (US Customary Units or Metric). The surveyor shall select the method. The choice of method may be based on the terrain, the area of the right-of-way to be disturbed by construction operations, and the land use adjacent to the right-of-way. Place reference points at locations where there is the least possibility of being disturbed during the construction period. Consider the utility of the reference points after cutting and filling to final grades. Keep records and sketches of the reference points in the alignment notebooks.

Avoid swing or chain ties at major control points (PC's, PT's, and PI's). Use three point right angle ties where possible, preferably two points to the right and one to the left or vice versa. Random transit crossties are acceptable. Three reference points per line are the rule with the angle of interception a minimum of 45 degrees. Refer to Figure 18.15.1 for Sample Construction Transit Notes.

The third order survey shall have a 1/5000 horizontal closure. Angle closure shall be 30"x$\sqrt{N}$ seconds where N equals the number of angles in the traverse. It is essential that the transit be "double centered" at the beginning of use, adjusted if required, and checked often enough to be sure it is in adjustment.

Promptly report errors of closure, in either angle or distance, to the Project Engineer for proper disposition.

18.15.4 Bench Levels

A complete, tight and dependable set of bench levels is one of the most important items of the construction survey. A large portion of the pay quantities relies on elevations as the basis of measurement. A loose line of bench levels is often the basis of disagreement and claims.

The equipment used for this work shall be in good repair and adjustment. Check levels by the two-peg method and adjust if necessary. Check each rod used for extended length and condition.

Before any staking involving elevations, verify the benchmarks shown on the plans for location and elevation. At this time, reestablish any benchmark that is disturbed by construction. Do the centerline profile at this time, if required.

In the case of an error in vertical control, run sufficient centerline profile to pinpoint the extent of erroneous elevations. Check the plans and design data for the effect the error has on the design quantities. Bring serious discrepancies to the attention of the Project Engineer and the Project Manager/Group Chief. Run a centerline profile to check design profile and quantities for "O" lines and any other areas where ground elevations may be suspect.

Consult the Project Engineer with respect to placement of benchmarks in areas of permafrost, muskeg, peat, or other unstable soils peculiar to the locality involved. Do not set benchmarks on utility poles. Utility poles are unstable and the spike is a safety hazard for maintenance personnel. Refer to Figure 18.15.2, Sample Level Notes.

Follow the procedures for checking and establishing benchmarks:

1. During the reading process, plumb the rod, wave the rod, and record readings to the nearest 0.01-foot.
2. Balance the backsight and foresight distances and elevations within any level loop.
3. Do not use side shots on benchmarks. Use the turn through method.
4. Establish benchmarks at intervals and locations consistent with good engineering practice and not more than 1,000 feet.
5. The allowable vertical error for disclosure in feet is 0.05 x $\sqrt{M}$ where M is equal to the length of the level circuit in miles.

   Correct errors in benchmark elevations in a manner that will not affect the elevations of succeeding benchmarks. If a minor error will change the elevation of succeeding benchmarks, set up an elevation equation at the point where the error is noted. You may need to make a minor adjustment in grade in this event. Report a major error to the Project Engineer for resolution, if it

will affect the elevation of succeeding benchmarks.

18.15.5 Clearing and Grubbing Stakes

This portion of the work is generally among the earliest operations by the contractor.

The specifications provide for measurement by one of the following methods:

1. Area basis—The clearing and grubbing is paid by the number of acres and fractions thereof acceptably cleared and grubbed within the staked limits. If areas not shown on the plans or not staked for clearing and grubbing, do not measure for payment. The limits of the areas to be cleared and grubbed shall be staked, so as to exclude those areas covered by existing roadway, lakes, ponds, existing stream beds and other areas not covered by trees or brush. Check the specifications for any special conditions pertaining to this method of payment.
2. Lump sum—In the event that measurements and payment for the work is by lump sum, stake and keep notes the same as for the area basis. No calculation of area is required; therefore no measurement of the area is needed.
3. Individual Unit Basis (Selective Tree Removal)—The Project Engineer will designate trees that are outside the normal clearing and grubbing limits. Refer to Figure 18.15.3, Sample Clearing and Grubbing Notes.

Stake the clearing limits per the plans. Avoid sharp breaks in the width of the clearing line and adjust stakes to overcome this. On road projects, give special attention to clearing lines on the insides of curves and at intersections to provide adequate sight distance when contract quantities and right-of-way limits permit this. The contractor may flag approximate culvert locations with the clearing and grubbing for any special cleanup for his culvert crews. Measure distances to the nearest foot and place standard lath to designate the intended limits. The use of surveyor's tape, cloth or other assorted miscellaneous items tied to brush or trees is not proper staking practice. Intervals for placing lath is dependent on terrain and denseness of the foliage, but generally, lath spacing of 100 feet is adequate. In areas of heavy timber, clearing stakes should be so set as to avoid leaving trees on the clearing line. Record in the field notes revisions of originally staked distances, which are required as the work progresses. Refer to Figure 18.15.3, Sample Clearing and Grubbing Notes.

18.15.6 Cross Sections

Perform cross sections and slope staking after clearing and grubbing.

The staking and measurement of earthwork is the source of more disputes than any other phase of the work. Performing cross sections and setting of slope stakes must be done with competent, experienced personnel properly equipped and instructed. Careful planning of the work is essential. Cross sections shall be taken wide enough to include all potentially disturbed areas.

Before cross sectioning and slope staking, the party chief prepares the slope stake books. Do the grade computations with a computer and make the resulting information available in hard copy. Make computations for all stations to be slope staked, in accordance with the plans and the Alaska Construction Surveying Requirements (US Customary Units or Metric).

Show in the slope stake book the adjusted elevation of the centerline, the distances from the centerline to each shoulder, and the adjusted elevations of each shoulder. Performing grade computations with care saves time during slope staking.

Perform cross sectioning and slope staking simultaneously after clearing and grubbing. Sections will be taken as often as necessary, but at least every station on tangent and every fifty feet on curves, and every station on tangent and every fifty feet on curves, and at all breaks in topography. Take additional cross sections at odd stations where structure exceptions begin or end. Extend the cross sections beyond the construction limits a minimum of twenty-five feet. Extend the sections further in areas of overbreak or slides.

Do cross sectioning with an engineer's level or transit in mountainous terrain. The engineer's level is the preferred method. When necessary, permit hand level turns, up or down from the instrument. Take sections on a perpendicular to the centerline on tangents, and on radial lines on curves. Use a transit or right angle prism to perform perpendiculars. Record H.I.s to the nearest 0.01 foot. Record cross section readings to the nearest 0.1-foot. Hold the tape horizontally with a minimum of sag and record readings to the nearest 0.1-foot from base or centerline.

Take final cross sections after the construction is complete. Plot all final cross sections. The Project Engineer shall make spot checks in areas where final cross sections are not required to assure that the work is in conformance with the slope stakes. Check areas of embankment in the same manner. Perform the work with one man working from the slope stakes with an engineer's rule, hand level, and cloth tape. Record notes in the inspector's diary. Document all pay quantities in this manner.

18.15.7 Material Sites

If the specifications call for measuring borrow by the ton or megagram, cross sectioning of the material sites is not required.

Measure borrow in the same manner as roadway excavation. Extend the regular cross sections to include a borrow pit adjacent to the construction. Compute the excavation and borrow quantities separately.

If the borrow pit is located away from the construction site, follow a systematic procedure of laying out the pit for cross sectioning. Determine and stake the area that the borrow is coming from. Establish base lines outside the anticipated work area to assure there is a reference for starting each series of cross sections. Extend the cross sections out to the base lines.

Locate and reference the base lines for use during final cross sections. If feasible, use the centerline datum for borrows pits. If this is not practical, set two benchmarks in reference to an assumed datum. Sketch the layout of the borrow pit on the first page of the borrow pit notes.

It may be necessary to stake the limit and the depth of excavation due to stipulations in the borrow permit. In most cases, remove the borrow to an elevation best suited for drainage and appearance.

Without exception, each subsequent cross-section will close the proceeding section at the outer limit of the excavation. When practical, tie material sites to the centerline of the project.

After borrow operations and trimming, do final cross sections at the exact location of the original cross sections and extend them to the base lines. Record any additional information about zero points of cut at this time. Refer to Figure 18.15.5, Sample Field Notes for Borrow pit layout. See Figure 18.15.6 for Sample Borrow Pit Cross Section Notes.

18.15.8 Slope Stakes

Slope stakes may be set in conjunction with the clearing and grubbing stakes. Set slope stakes at the same intervals as cross sections. See Section 18.15.6 for intervals of cross sections and the Alaska Construction Surveying Requirements (US Customary Units or Metric) for additional information. Set the stakes at points where the cut or fill slopes intersect the surface of the natural ground. Make visual inspections of the stake, with reference to previous stakes, taking into consideration any change in slope and grade to avoid abrupt, unsightly breaks in slopes.

There are several satisfactory methods of showing information on slope stakes. The intent is to provide the workers with the minimum information of:

1. Where to begin a cut or fill.
2. Which slope to follow.
3. The depth or height of the cut or fill.

Show additional information, but not to the point of confusion.

Do not use hand levels for setting slope stakes, except two turns up or down from the instrument to the catch point. Clearly note hand level TPs in the field book.

There are several different methods to set slope stakes, dependent on the terrain. Use one of the three primary methods to set slope stakes.

1. Use a level instrument, level rod, and cloth tape. This preferred method is best suited to relatively flat or rolling terrain where it is possible to run the profile, cross section, and set the slope stakes with only a few additional instrument setups.
2. Use a level, transit, level rod, cloth tape or chain. Employ this method in rough or mountainous areas.
3. Use an Electronic Distance Measuring instrument and a level rod. Employ this in all terrain.

Follow the established and accepted surveying techniques when leveling, chaining, and rod reading as outlined in Section 18.15.6. Cross Sections. Grade on slope stakes shall be within 0.1 foot. See Figures 18.15.7-18.15.11 for slope stake procedures and sample notes.

18.15.9 Slope Stake Reference

Set a reference for each slope stake section on one side or both. The reference shall be set a minimum of ten feet and a maximum of twenty feet beyond the slope stake. The main purpose of the reference is to convey the slope stake information in the event the slope stake is disturbed or destroyed. Provide the amount of information on the reference stake to allow for its replacement. A hub should be driven flush with the ground at the reference stake and reference all elevations to this hub. It is good practice to run an independent level circuit over the reference hubs to check for errors. Perform this check in areas of heavy grading. Figure 18.15.7 shows methods that convey the minimum required information.

18.15.10 Grade Stakes

The contractor is required to bring the roadway slopes up or down per the slope stakes. As grade is approached, additional stakes must be set so that the surface is brought to the proper elevation and the slopes are true. Use grade stakes for rough grading of the prism to the top of embankment. Use red tops and blue tops for fine grading of the prism.

Usually when the depth of the subbase is variable, provide grade stakes indicating the shoulder line and elevation of the rough grading (bottom of selected material). Provide grade stakes indicating separation of two types of selected material.

These stakes consist of standard length lath. Set the stakes to rough line and grade. The grade inspector must check these stakes at random for accuracy.

18.15.11 Blue and Red Tops

After completing the embankment, set red tops at the top of each subbase layer. Set blue tops at the top of base course. Set blue and red tops at centerline and shoulders. Frequency of red and blue tops is the same as cross sections. Place blue and red tops at the required locations. Drive the stake so that the top of the stake is at the elevation of the finished grade. A good grade foreman and grader operator should be capable of finishing the grade to ±0.1 foot before calling for blue tops. Call the grader operator back to finish grading if the grade varies more than ±0.2 foot.

Provide staking in areas of critical drainage to assure adequate slope. Do not allow ponding of water along embankments, in special ditches, drainage ditches, and channel changes.

Set red tops accurately to line, solidly driven. Record H.I.s and grade rods to the nearest 0.01-foot. Set the grade elevation to plus or minus 0.05 foot.

Set blue tops accurately to line, solidly driven. Record H.I.s and grade rods to the nearest 0.01-foot. Set the grade elevation to plus or minus 0.02 foot. See Figure 18.15.12, Sample Blue Top Notes.

18.15.12 Culverts

Stake culverts early to determine the amount of culvert pipe. A good time to do culvert staking is during slope staking.

Drive hubs on the extended centerline of the culvert at a convenient distance from the ends to be out of the way of the excavation, but close enough for easy reference. Show the information necessary to construct the culvert on the guard stake. Show in the culvert book the minimum information to stake a culvert:

1. Station.
2. Size, length, and type of pipe (Such as 24” x 60’ CMP).
3. The amount of cut or fill from the top of the hub to the flow line at the end of the pipe.
4. The horizontal distance from the hub to the end of the pipe.
5. The gradient of the pipe.
6. The amount of camber (if required).

It may be desirable to set additional stakes offset along the centerline of the pipe showing the amount of cut or fill to the flow line at the location of each stake. When the culverts are in rough terrain or of considerable length, offset stakes are desirable. Stake headwalls for culverts on each side of the culvert on line with the face of the headwall.

A single cross section along the flow line of the structure is adequate. Occasionally, running transverse sections provide better excavation information. Indicate staking data, cross sections, and other pertinent data in the culvert book. Normally, culvert pipe is paid for by the linear foot. Measure the culvert pipe installation according to the specifications. The Project Engineer must approve culvert relocations and changes in length of culvert. See Figure 18.15.13 for Sample Culvert Installation.

18.15.13 Miscellaneous Drainage Facilities

The plans show the location, type, size, length, and flow line elevations for miscellaneous drainage facilities. Before staking, field check the plan information to assure adequate drainage characteristics. The Project Engineer must approve minor changes in locations and grades to meet existing field conditions.

Ditches and channels

Generally, this work is unclassified excavation. Slope stake and cross section per Sections 18.15.6 – 18.15.9. In the absence of no typical section on the plans, provide sufficient width and depth to accommodate existing field conditions.

Underdrains and sewer

Use a similar procedure to establish the flow line for underdrains and sewers as for culverts. Provide adequate outlets and establish flow lines that connect to existing drains.

Set line and grade stakes for underdrains and sewers at intervals not greater than twenty five feet and offset stakes a distance that will insure their permanency during construction operations.

Manholes, catch basins and inlets

Construct manholes, catch basins, and inlets adjacent to any curb and gutter. Take extreme care in staking so they will fit properly into the design of the facility. Adjust castings after the curb and gutter are set.

The straddle hub method fixes the position of manholes, catch basins, and inlets. Set a grade hub stake offset a distance to protect it from disturbance. Indicate clearly the portion of the structure on the guard stakes at the straddle hubs. The guard stake at the grade hub shall have the distance to the top of the structure, the distance to the flow line, and to what point on the structure these distances refer.

It may be desirable to have separate field books for each phase of the work on projects where there are a number of manholes, catch basins, and inlets. Use separate pages in the field books for each structure. Show the location, type, and size of each structure with a staking diagram showing all distances and elevations in the field notes. See Figure 18.15.14 for Sample Methods of Staking Manholes, Catch Basins, and Inlets.

Dikes

Stake dikes to the alignment, grade, and slopes shown on the plans or as necessitated by field conditions. Slope stake to the shoulder of the dike with distances referenced to centerline of the dike. Use the same method of staking as for embankments.

Set up a separate field book for all dikes. Show a sketch tying to the centerline of the main facility and position in relation to the main facility.

Riprap and slope protection

Stake all riprap and slop protection after constructing the fill, channel change, or dike. The slope must be in substantial conformance before placement of the riprap or slop protection. Slope stake all bank protection when feasible. The surveyor may use special methods in staking unusual bank conditions. Set up a separate book for riprap and slope protection.

18.15.14 Miscellaneous Construction Staking

The surveyor shall provide sufficient stakes for the adequate control of all structures and incidental construction. The surveyor shall take into consideration the contractor's proposed methods of constructing the project to prevent the destruction of the controls by the contractor's operations.

Guardrail and guide posts

The plans show the guardrail and guide post locations with special instructions on standard detail sheets. It is difficult for a designer to accurately locate these facilities. Field check these locations before staking and making adjustments in lengths and location.

Signs

Stake signs at the location shown on the plans. A lath or hub indicating the location and identification of the sign is usually sufficient.

Right-of-way monuments

A professional land surveyor registered in the State of Alaska must supervise the staking and setting of right-of-way monuments. Set the monuments using a third order survey. Stake right-of-way monuments at the locations indicated on the plans. Do not set monuments in loose fill slopes, slides, streams or other locations where it is apparent that their position is incorrect.

Stake right-of-way monuments using the straddle hub method. Set right-of-way monuments using a transit and chain or Electronic Distance Measuring device. Position the monument to the nearest 0.1 foot. Set up a separate book for right-of-way monuments. Sketch each monument showing ties to centerline and position in relation to the facility.

Curb and gutter sidewalks

Set the stakes for curb and gutter forms with an instrument for alignment and grade as shown on the plans. They will be set at full and half stations on tangents, twenty-five to fifty foot intervals on horizontal curves, and not greater than twenty-five foot intervals on vertical curves. Curb returns and sidewalk radii require special attention when staking.

Use the offset line of tacked hubs for accurate alignment and grade correct to the nearest 0.01 foot. Visually check the final position of the forms by sighting along the form from either direction. Thoroughly check the forms for line and grade before concrete placement. In the field book, show a staking diagram in relation to centerline; dates and locations of concrete pours; and measurement of pay quantities. See Figure 18.15.15 for a method of staking curb returns.

18.15.15 Major Structures

The first step in any structure layout is to check all dimensions and elevations shown on the plans.

Stake and reference only those centerlines and layout lines used as dimensional references on the plans. These lines include:

1. Centerline or layout line of bridge.
2. Centerline of bent, pier, or abutment.
3. Layout lines for wingwalls or retaining walls.

Do not stake specific structure element locations such as piles, edge of footing, end of wall, or other details that are located from staked lines and plan dimensions. The inspector shall check these locations after the contractor establishes them.

Sketch a layout showing the location of all control points. Stake control lines for use by carpenters, excavation foreman, and others.

Do layout work carefully and accurately to convey information clearly and without confusion. Check all work from computation through staking to eliminate errors. Compute and stake elevations and alignment to the nearest 0.01 foot. Specific field methods shall be suited to the needs of the individual survey. Use third order survey accuracy for all bridge work. See Figure 18.15.16 for an example of field notes for such a structure layout. The Project Engineer shall check the overall length of the bridge and all computed distances.

Control lines shall be referenced so points in or near work areas are reset with minimum effort. It is normal to lose a certain number of control points during construction. Reference each pier centerline with at least three points on each side of the bridge. Set a working point on each side of the bridge fifty feet from the bridge centerline. Set one reference on each side of the bridge at least 150 feet or whatever distance is necessary to clear all construction activity. Set up a coordinate system to check the original layout and to facilitate resetting points removed or displaced by construction activity. By knowing the coordinates of all control points, it is easy to compute distance and bearing from any point to any other.

The Project Engineer shall check all detail layout work done by the contractor. Before any forms are set, check batter boards for line and grade.

Set a minimum of two good benchmarks for each bridge site. Locate one near the substructure work, as it is practical, and the other a distance from the bridge where it is safe from construction operations. The primary use of the second benchmark is to reestablish elevation control in the event that the working benchmark near the bridge is lost or disturbed. Establish a benchmark on an abutment or pier cap as soon as construction allows for setting and checking all superstructure grades.

18.15.16 Monuments Established by Others

A very important activity of construction surveying is the location, marking, and protection of monuments inside or outside the construction limits.

The Project Engineer shall obtain from the region copies of the right-of-way plats for the project before beginning survey work on the project. Make an active search for all monuments. A Professional Land Surveyor registered in Alaska must replace any public survey monuments.

Public land monuments

Protect existing land monuments within the paved portion of the project with monument cases. Place monuments located under graveled surfaces, unpaved shoulders, fill slopes, back slopes, or ditches six inches below the surface.

Preserve all U.S.G.S., U.S.C., G.S., B.L.M., and other agency benchmarks, triangulation points, land monuments, and other permanent markers found on the project. Use third order survey accuracy in the replacement of all public land monuments.

Private survey monuments

Use a Professional Land Surveyor registered in Alaska to set all survey monuments. Conduct a search for all property marks shown on the survey plats or subdivision plats. If corners shown on the plats can not be located, contact the property owner, if possible. The Memorandum of Agreement describes the disposition of survey monuments within the right-of-way. The Department is very concerned when a property owner claims that his property marker was destroyed during construction and was not replaced. Show a dated and signed entry in the monument field book stating what action was taken for each marker on the project. Place emphasis on describing attempts to locate markers that could not be found.

It is policy of the Department to reference and reset in its original location any private survey monument or marker, which may be disturbed by construction.

When the original monument or marker cannot be reset, establish one or more permanent reference markers, plainly marked as a witness corner as near as practicable to the original mark. Submit the original field notes to the regional Right-of-Way section.

18.15.17 Party Chief's Diary

The survey party chief on the project shall keep a factual diary of all work performed by the survey crew on the project on a daily basis. The diary shall contain:

1. Date.
2. Weather.
3. Crew.
4. Type and location of work being performed.
5. Work accomplished.
6. Orders from the Project Engineer.
7. Signature.

This record is extremely important in case of claims by the contractor, or claims from abutting property owners that their monuments have been destroyed and were never reset.

18.15.18 Contractor Furnish Surveying

Check the contract for any special provisions modifying the Construction Surveying and Monuments Section 642 of the Standard Specifications for Highway Construction and the Airport Contract for any Special Provisions modifying Contractor-furnished surveying.

The surveyor shall be a registered Professional Land Surveyor, currently registered in the State of Alaska and shall follow the Alaska Construction Surveying Requirements (US Customary Units or Metric) in the specifications.

The Project Engineer or his representative shall randomly spot-check the Contractor's surveys, staking, and computations. The contractor will provide the Project Engineer notice prior to performing any work, and will furnish the appropriate data as required, to allow for such random spot-checking. The Department assumes no responsibility for the accuracy of the work.

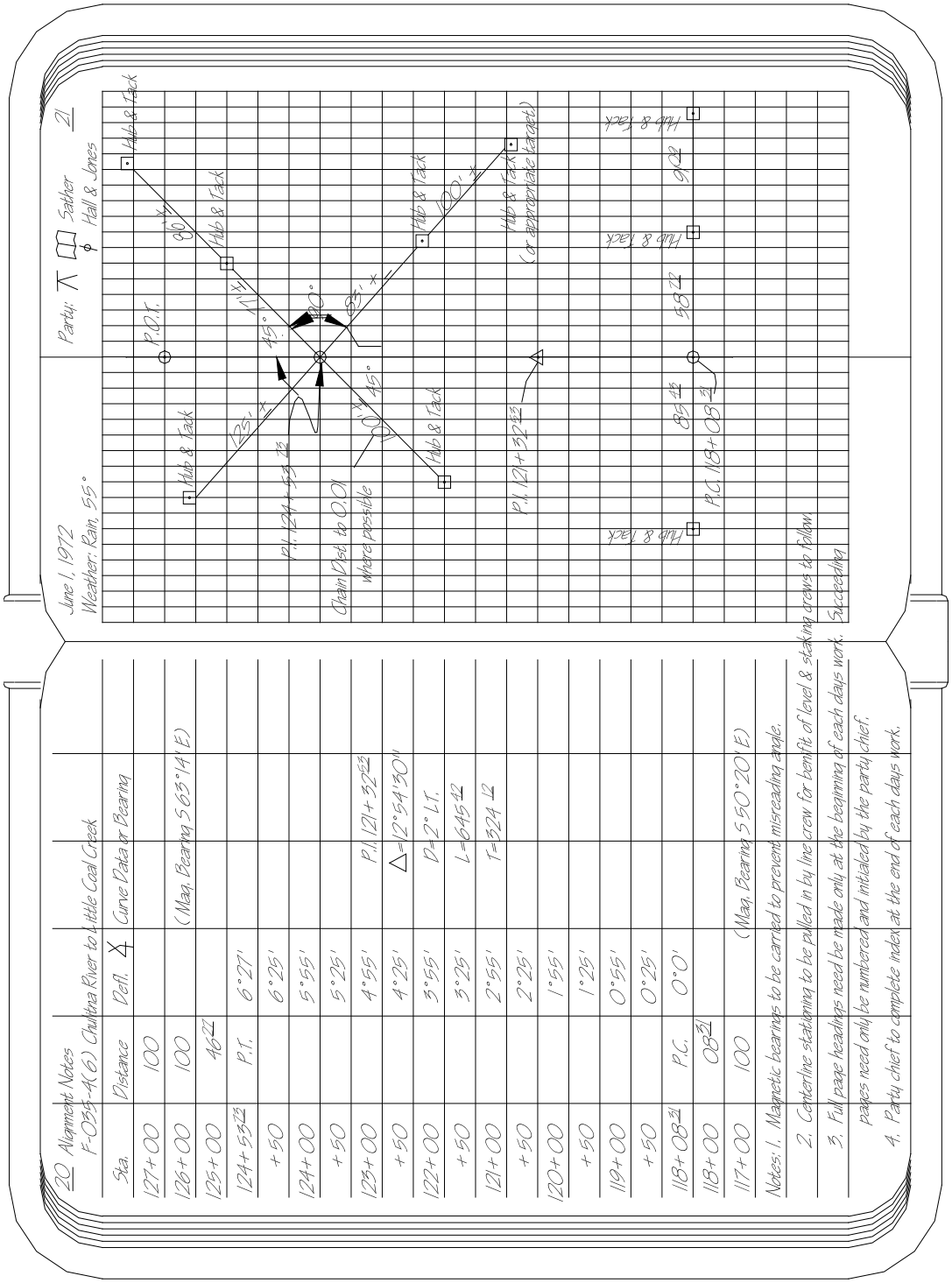

Figure 18.15.1
Sample Construction Transit Notes

38 Benchmark & Profile levels
F-055-A(6) Chultina River to Little Coal Cr.

June 1, 1992
Weather: Fair, 55°-75°
5-10 M.P.H. Wind

Party: T, Sather, Helms

39

Sta.	B.S. +	H.I.	F.S. -	Elev.	
					Comp. E.C.S. - P.C.
					CK. J.B. - D.E.
T.B.M. #10				529.25	Nail in base of 12" spruce, 86' Lt. 107+55
	12.72	541.25			
108+00			6.4	534.8	
109+00			7.6	534.4	
110+00			9.7	532.2	
T.P.			10.25	531.20	Keel Mark on rock, 10' Lt. ℄ 110+15
	5.62	537.82			
111+00			7.6	537.3	
112+00			8.4	536.5	
T.P.			9.26	535.46	Hub Lt. Sh. Existing Rd. 112+20
	7.25	535.31			
113+00			5.6	537.7	
T.B.M. #11			5.56	537.56	Nail in Base of 30" stump, 60' Rt. Sta. 113+25 - Elev. 529.57
(ΣB.S.'s 23.98)		(ΣF.S.'s 23.66)			
	4.12			529.32	
114+00		534.36	5.6	528.8	

Note: 1. ΣBS's & FS's need not be shown but personnel should recognize need for approximate balancing.

2. Full page headings need be made only at the beginning of each days work. Succeeding pages need only be numbered and initialed by the party chief.

3. Party chief to complete index at the end of each days work.

Figure 18.15.2
Sample Level Notes

27 Clearing and Grubbing
F-035-A(6) Chitina River to Little Coal Cr.
August 6, 1992
Weather: Fair, 50°-60°
Sta. Feet: 5-10 M.P.H. Wind
Party: Father
Ch. Jones
Ch. Helms
25
Completed By: (Inspector) Date:
Comp. B.C.S. - P.C.
CK. J.B. - O.E.
Sta. | Lt. | Rt. | Total Width | Avg. Width | Dist.
+50 | 26-0 26 | 16-30 14 | 40 | | |
| | | | 41 | 50
2050
| 27-3 24 | 15-31 18 | 42 | | |
| | | | 43 | 50
2150
| 29-5 24 | 11-31 20 | 44 | | |
| | | | 46 | 50
2300
| 32-8 24 | 8-32 24 | 48 | | |
| | | | 50 | 50
2500
| 35-11 22 | 5-35 30 | 52 | | |
| | | | 51 | 50
2550
| 35-15 20 | 3-33 30 | 50 | | |
| | | | 50 | 50
2500
| 34-16 18 | 52 | 50 | | |
| | | | 48 | 50
2400
| 32-19 16 | 30 | 46 | | |
| | | | 45 | 50
2250
| 6-0 31-21 16 | 28 | 44 | | |
| | | | 44 | 50
2200
| 5-0 30-24 14 | 30 | 44 | | Total Page No. = 20,900
Note: 1. Total each page.
2. Full page headings need be made only at the beginning of each days work. Succeeding pages need only be numbered and initialed by the party chief.
3. Party chief to complete index at the end of each days work.

Figure 18.15.3
Sample Clearing and Grubbing Notes

Figure 18.15.4
Individual Removal of Trees and Snags

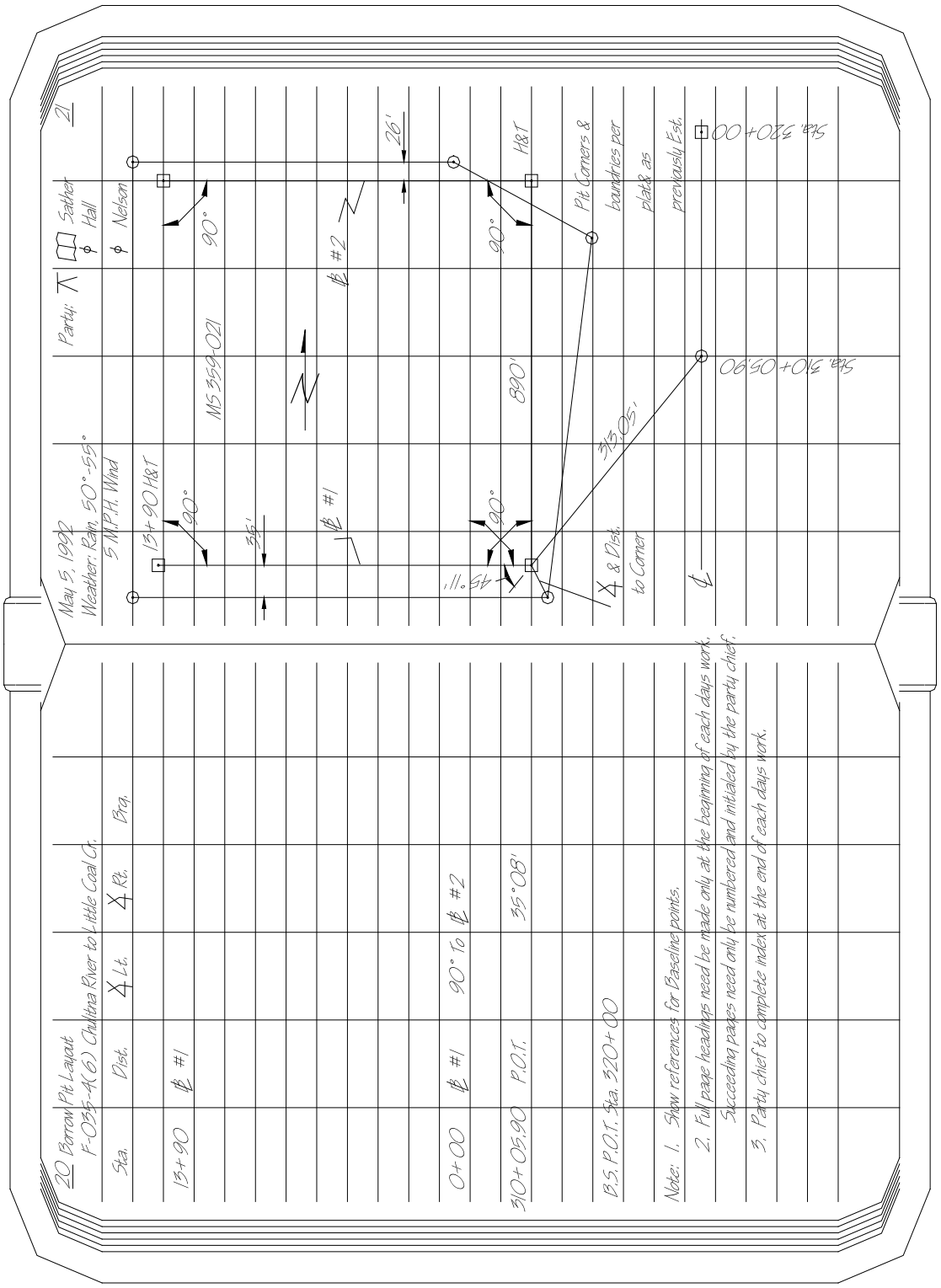

Figure 18.15.5
Sample Field Notes

Figure 18.15.6
Sample Borrow Pit Cross Section Notes

Figure 18.15.7
Sample Slope Stakes (Page 1 of 2)

Figure 18.15.8
Sample Slope Stakes (Page 2 of 2)

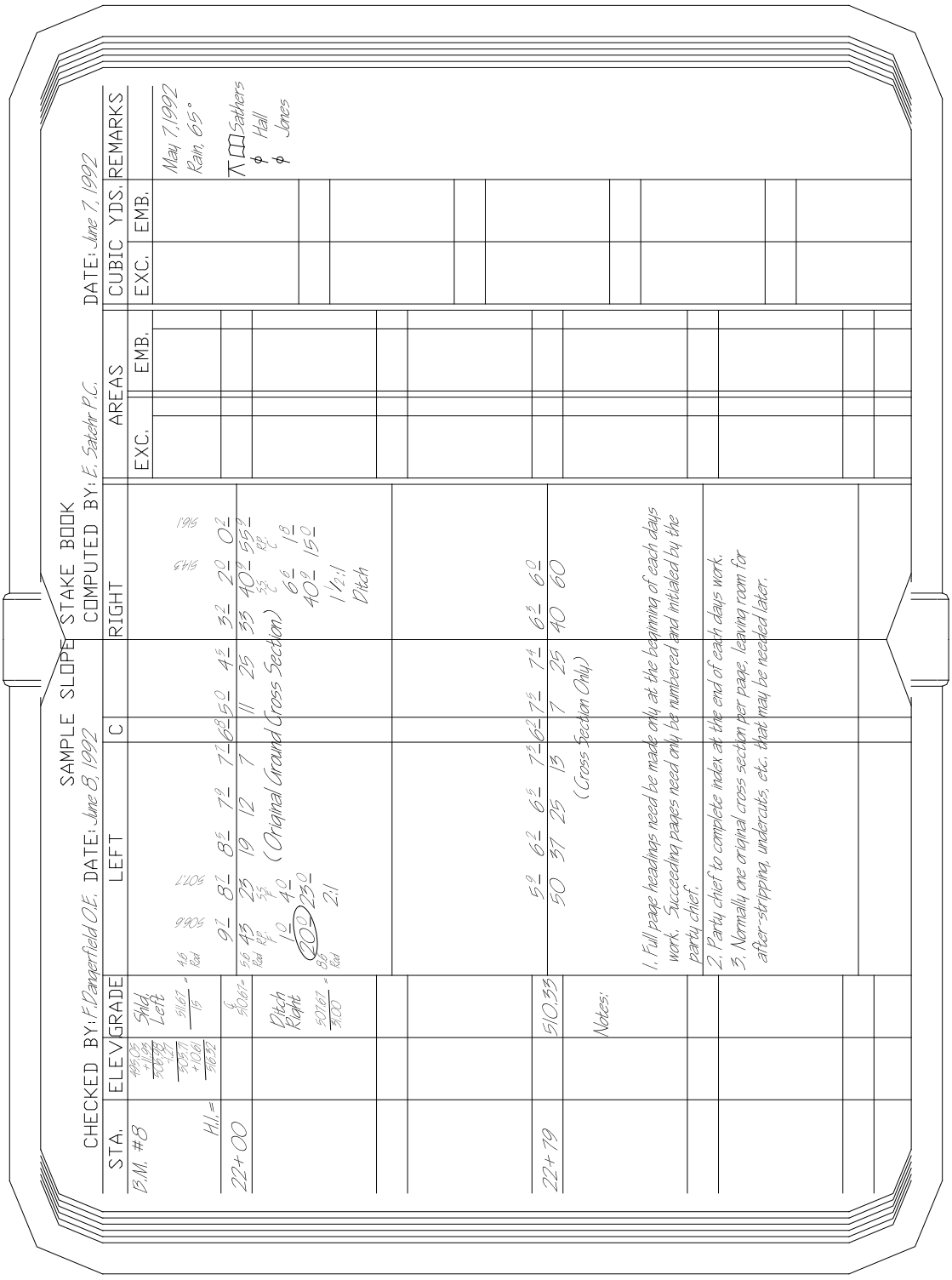

Figure 18.15.9
Sample Slope Stake Book

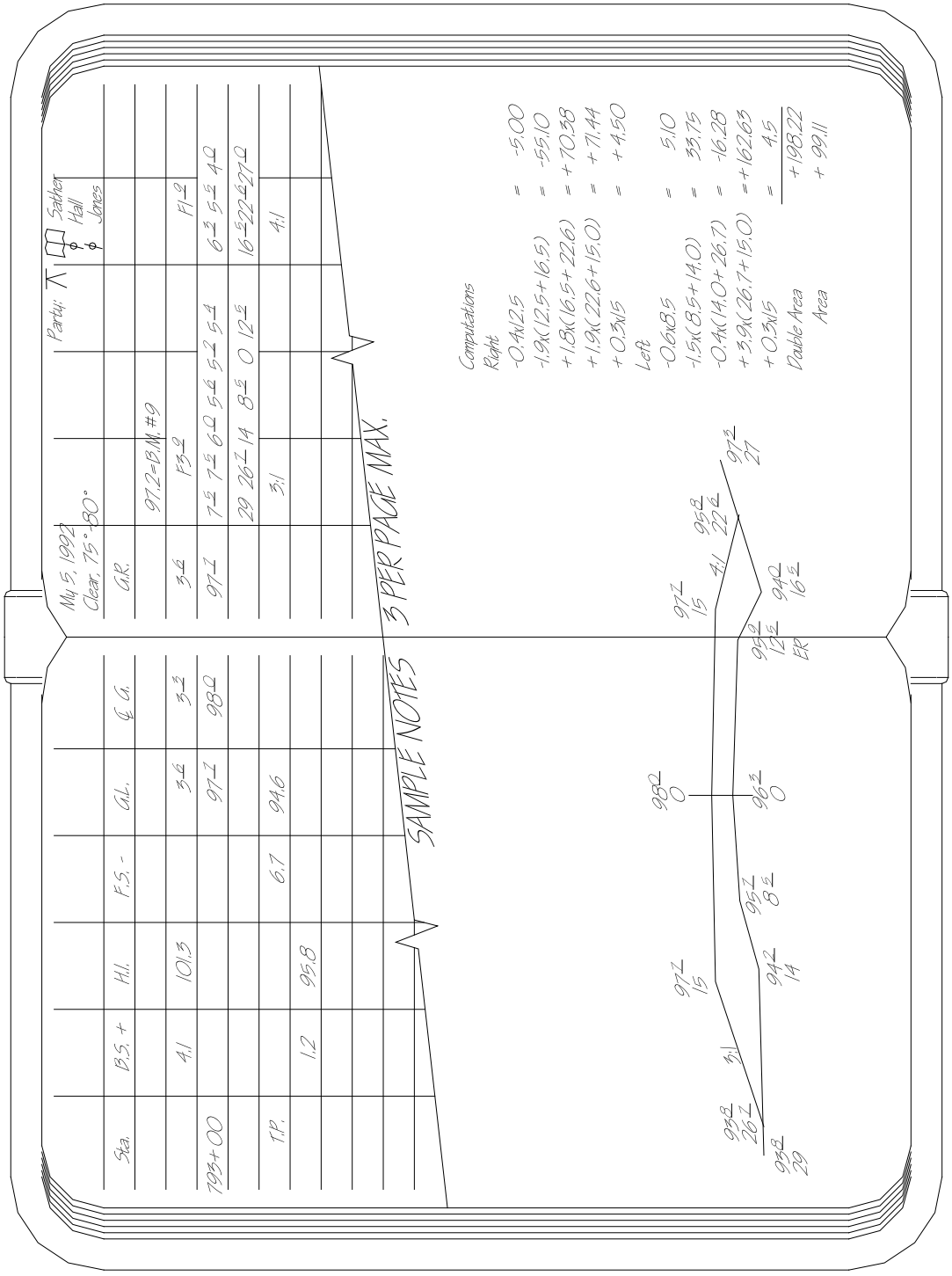

Figure 18.15.10
Sample Notes

Setting Cut Stakes	Setting Fill Stakes
Explanation of markings: **Front** C 6^{6}, 40^{9}, 1 ½ : 1, ditch 8^{0} indicates a cut of 6.6' beginning at the SS and progressing on a 1 ½ : 1 slope to the back of the 8' ditch. **Side** S=1.0' R indicates 1.0 foot of superelevation from centerline to shoulder line on a curve to the right. **Back** Centerline C 3^{6}, 22+00 indicates a cut of 3.6' from the SS to centerline grade and the station of the SS being 22+00. **RP No. 2** **Front** C 1^{8} 15^{0}, 22+00 indicates that the natural ground at the slope stake is 1.8 feet lower in elevation than the natural ground at the RP, the RP is offset 15'beyond the SS and that the station of the RP is 22+00. **Side** Repeat the same information that is on the SS. **Back** Repeat the same information that is on the SS. This is turned away from centerline to attract attention. In the event the SS is missing the cut will not be started at the RP.	Explanation of markings: **SS No. 1** **Front** F 4^{0}, 23^{0}, 2:1 indicates a fill of 4' beginning at the SS and progressing on a 2:1 slope to shoulder line and elevation. **Side** S=1.0' R indicates a 1.0 feet of superelevation from centerline to shoulder line on a curve to the right. **Back** Centerline F 3^{0}, 22+00 indicates a fill of 3' from the SS to centerline grade and the station of the SS being 22+00. **RP No. 1** **Front** F 1^{0}, 20^{0}, 22+00 indicates that the natural ground at the slope stake is 1.0 foot higher in elevation than the natural ground at the RP, the RP is offset 20' beyond the SS and that the station of the RP is 22+00. **Side** Repeat the same information that is on the SS. **Back** Repeat the same information that is on the SS. This is turned away from centerline to attract attention. In the event the SS is missing the fill will not be started at the RP.

Figure 18.15.11
Slope Stake Explanations

Figure 18.15.12
Sample Blue Top Notes

Figure 18.15.13
Sample Culvert Installation

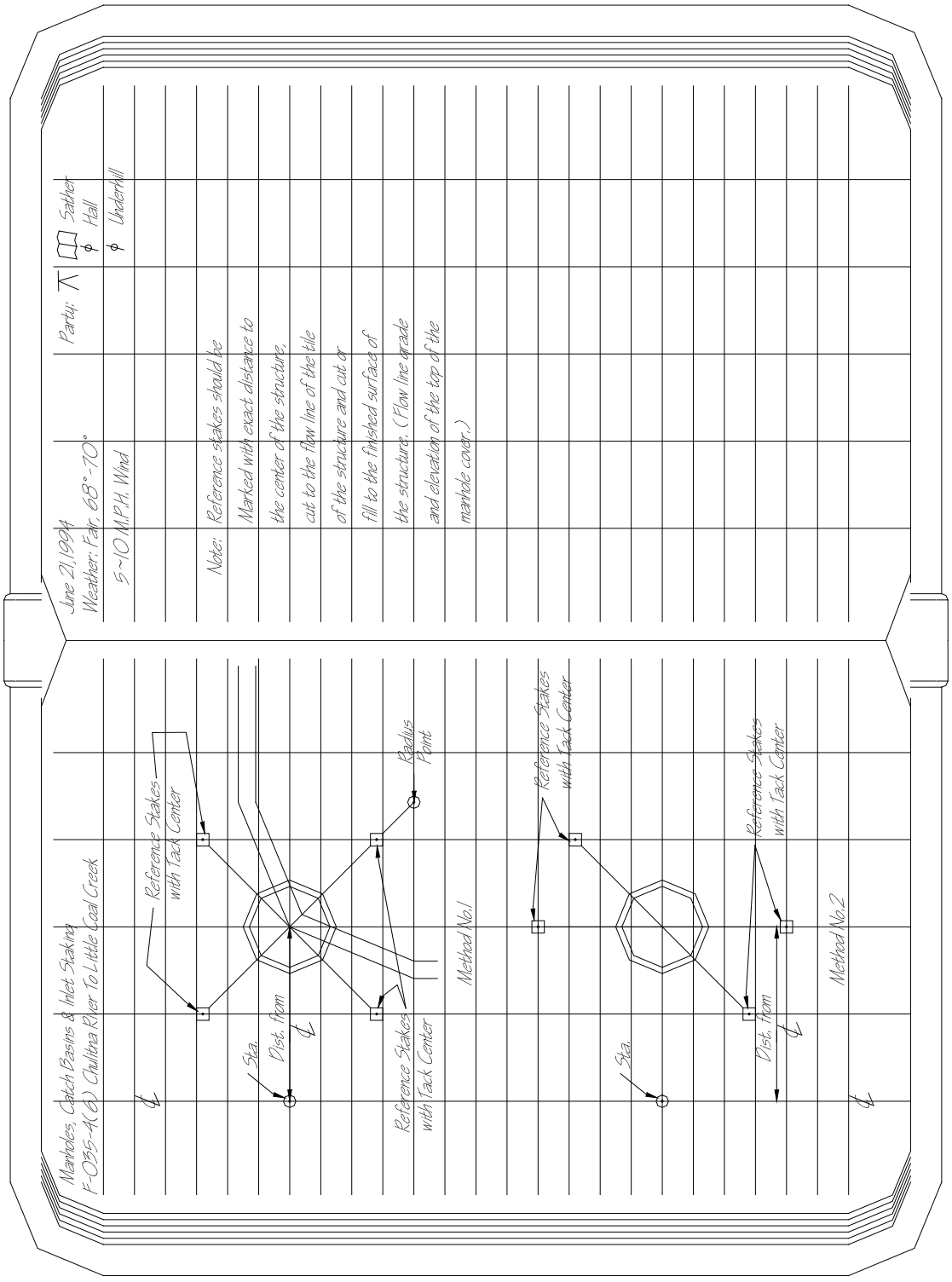

Figure 18.15.14
Sample Methods of Staking Manholes, Catch Basins, and Inlets

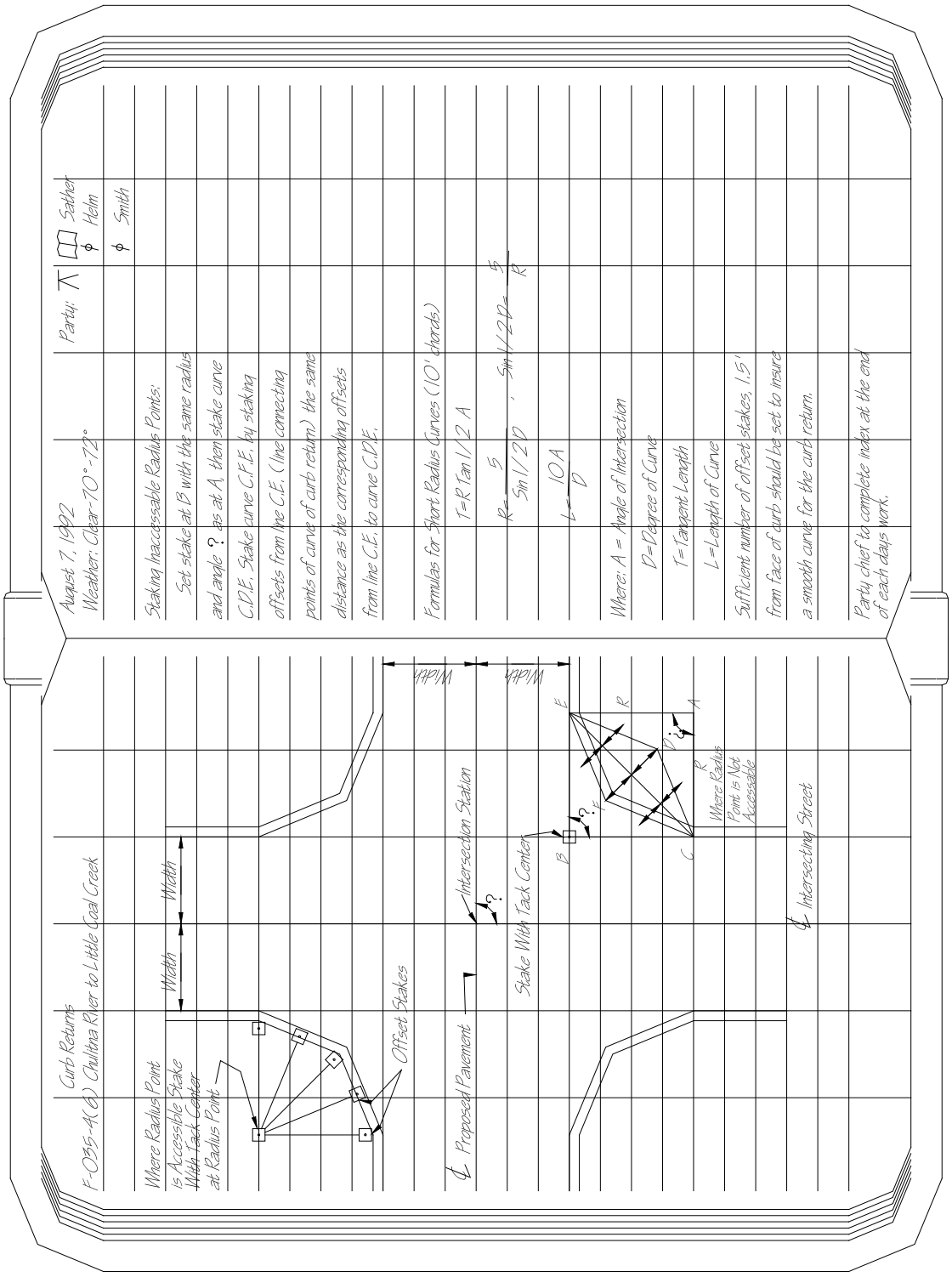

Figure 18.15.15
Sample Methods of Staking Curb Returns

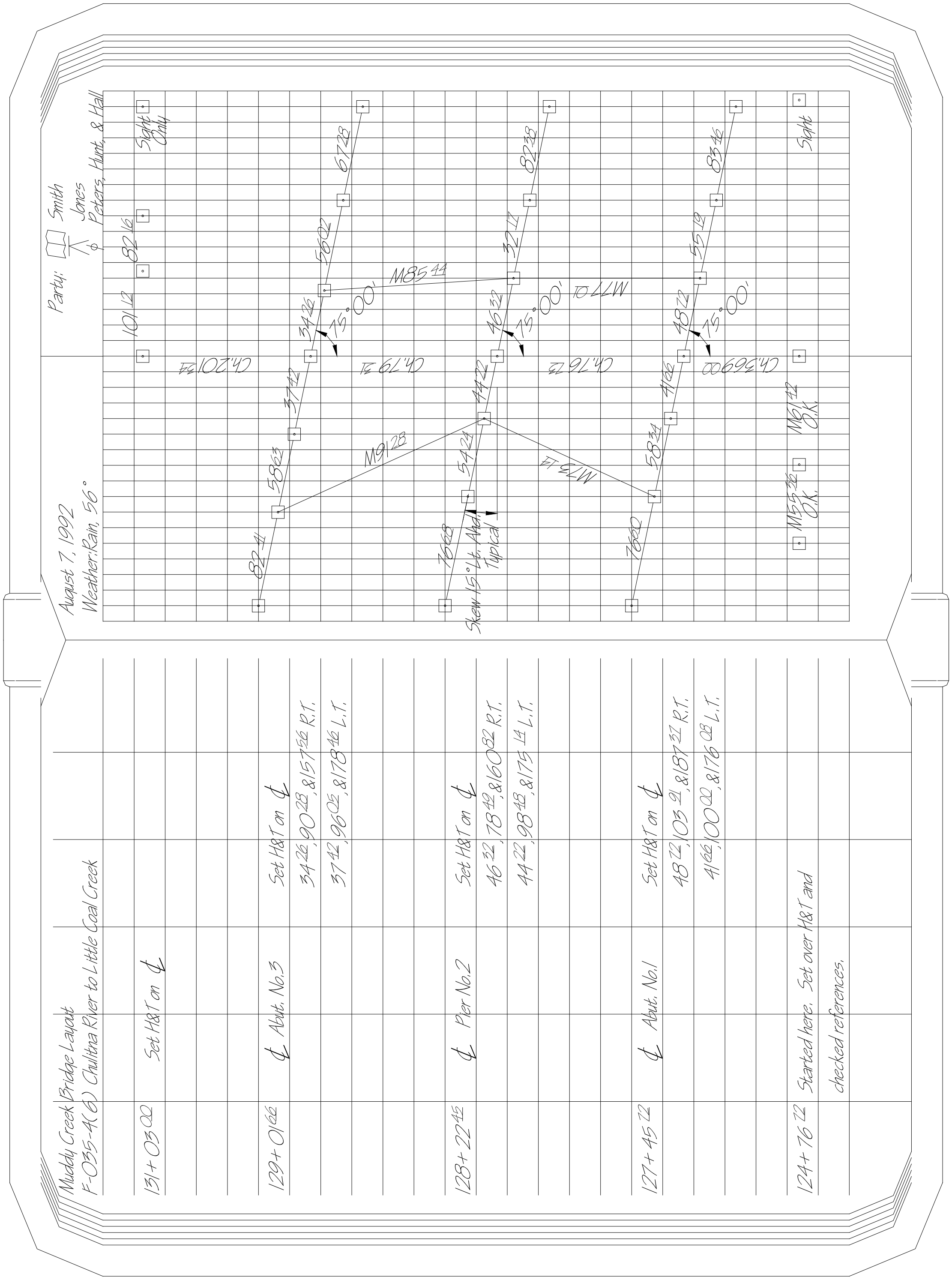

Figure 18.15.16
Sample Structure Staking Notes

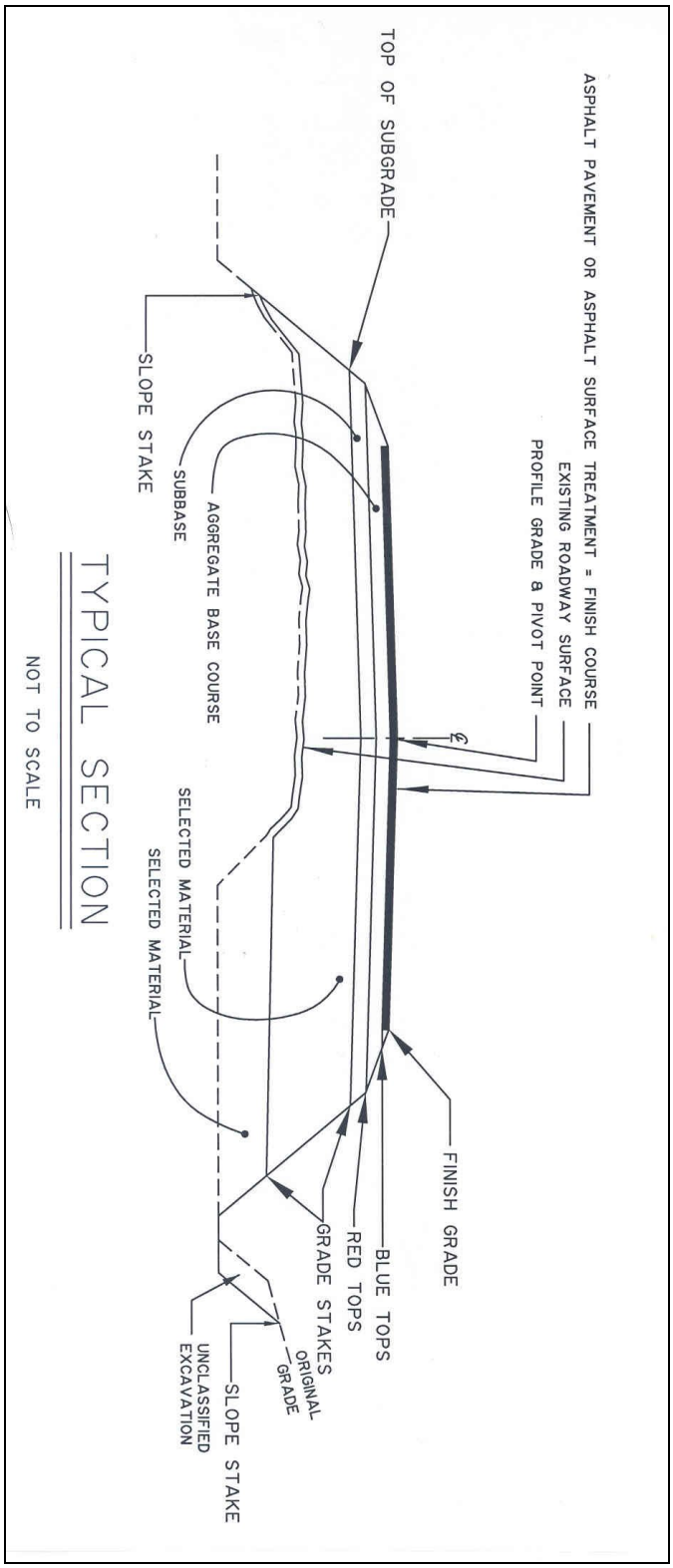

Figure 18.15.17
Typical Section

Exhibit A
Sample Blasting Notes

18.16. Calculating Equitable Adjustments

An equitable adjustment is a change in the contract price and/or time that preserves the relative cost and pricing principles of the original contract. The contractor and the Project Engineer will attempt to negotiate an equitable adjustment that is fair and acceptable to both parties. The adjustment will be based on costs and credits that are "allowable costs" for overhead and profit.

A cost is allowable if it:

- Meets the definition of "cost" in the contract
- Is reasonable
- Is allocable to the contract
- Is compensable under the terms of the contract and Alaska law
- Is incurred as a result of the act or event giving rise to the request for, or issuance of, the equitable adjustment

Guidance on determining reasonableness can be found in 48 CFR 31.201-3.

"A cost is reasonable if, in its nature and amount, it does not exceed that which would be incurred by a prudent person in the conduct of competitive business. Reasonableness of specific costs must be examined with particular care in connection with firms or their separate divisions that may not be subject to effective competitive restraints. No presumption of reasonableness shall be attached to the incurrence of costs by a contractor. If an initial review of the facts results in a challenge of a specific cost by the contracting officer or the contracting officer's representative, the burden of proof shall be upon the contractor to establish that such cost is reasonable.

What is reasonable depends upon a variety of considerations and circumstances, including:

a. Whether it is the type of cost generally recognized as ordinary and necessary for the conduct of the contractor's business or the contract performance;

b. Generally accepted sound business practices, arm's length bargaining, and federal and state laws and regulations;

c. The contractor's responsibilities to the government, other customers, the owners of the business, employees, and the public at large; and

d. Any significant deviations from the contractor's established practices."

Guidance on whether a cost is allocable to the contract is provided in 48 CFR 31.201-4.

"A cost is allocable if it is assignable or chargeable to one or more cost objectives on the basis of relative benefits received or other equitable relationship. Subject to the foregoing, a cost is allocable to a federal contract if it:

a. Is incurred specifically for the contract;

b. Benefits both the contract and other work, and can be distributed to them in reasonable proportion to the benefits received; or

c. Is necessary to the overall operation of the business, although a direct relationship to any particular cost objective cannot be shown."

Guidance on whether the Department is entitled to a credit and how it will be determined is provided in 48 CFR 31.201-5.

"The applicable portion of any income, rebate, allowance, or other credit relating to any allowable cost and received by or accruing to the contractor will be submitted to the Department either as a cost reduction or by cash refund.

The percentage rate payable to the contractor will be a rate established by mutual agreement between the Department and the contractor, taking into consideration the contractor's customary overhead and profit rates as documented by the contractor's accounting and financial records.

The term "price" means allowable costs (as defined above) plus profit, plus overhead

18.17. Night Work

The Special Provisions and Standard Modifications of a contract may require or allow a contractor to perform the construction during the night. Night work is defined as work occurring between sunset to sunrise, except for work occurring on the days that no lighting is required for a specific latitude, see the table in 643-1.02. The Worksite Supervisor is responsible for implementing the Night Work Lighting Plan. Work zone illumination shall be subsidiary to other items.

18.17.1 Night Work Lighting Plan

The contractor is required to submit a Night Work Lighting Plan to the Project Engineer with the Traffic Control Plan 30 days prior to the start of night work for all projects where night work is planned. The Project Engineer has seven days to review the plan. The contractor will make necessary modifications in response to any comments by the Project Engineer. The contractor is not allowed to begin night work before the plan approval.

The Night Work Lighting Plan shall include:

- Layout plan showing light location and configuration, including both typical spacing and lateral placement.
- Description of light towers.
- Description of electrical power source.
- Specific technical details on all lighting fixtures to be provided.
- Details on any hoods, louvers, shields, or other means to be used to control glare.

18.17.2 Lighting of the Night Work

The contractor shall illuminate night work areas as required in the specifications.

The contractor shall maintain the required lighting equipment. See Table 643-2 for a listing of specific tasks and required lighting equipment.

The Project Engineer shall monitor the lighting system for unacceptable glare and notify the contractor to correct the situation when it occurs.

The contractor needs to beware of overhead height restrictions (such as trees, aerial utilities, or bridges) when moving the lighting system.

Existing street and highway lighting do not eliminate the need for the contractor to provide lighting.

18.17.3 High Visibility Clothing

All flaggers and workers who work next to traffic or equipment (includes workers who represent the Department), and who are under the contractor's control (including all subcontractors), must wear clothing that meets specifications.

Department personnel shall maintain all vests, jackets, coveralls, raingear, hard hats, and other apparel in a neat, clean, and presentable condition.

18.18. SCWE Program

18.18.1 Purpose

The purpose of this section is to describe the intent, function and operational procedures for the Alaska Department of Transportation and Public Facilities (DOT&PF) Safety Conscious Work Environment (SCWE) Program.

18.18.2 What is SCWE?

A safety conscious work environment is one which employees feel free to raise safety concerns without fear of retaliation.

18.18.3 Scope and Applicability

The intent of the SCWE program is to foster an atmosphere to encourage employees' willingness to identify safety concerns. The SCWE program applies to all DOT&PF employees. The program provides guidance to employees who have concerns about safety practices, harassment, hostile workplace, or similar problems while on the job. The program provides an overview of the protections afforded under the various regulations.

18.18.4 Policy

We are committed to provide an environment where employees are encouraged to raise safety concerns without fear of retaliation. It is appropriate for employees to spend work time into reporting concerns. Management at all levels invites the communication of safety concerns and is committed to the timely investigation and disposition of all safety-related issues. Retaliation for raising concerns will not be tolerated and when found appropriate management action will be taken.

18.18.5 Reference

This SCWE Program is established in accordance with employee protection as required under state and federal laws and regulations to include:

1. Section 211 Energy Reorganization Act, 42 U.S.C. § 5851—Section of the Energy Reorganization Act of 1974 dealing with Whistleblower Protection;
2. 10 CFR 30.7—NRC Employee Protection for engaging in protected activities regulations;
3. Title 29 CFR—OSHA regulations
4. May 1996 NRC Policy Statement—Requires the establishment of a Safety Conscious Work Environment;
5. Alaska Statute Title 18—Health, Safety, and Housing; Chapter 60 – Safety
6. Alaska Statute Title 39—Public Officers and Employees; Chapter 90. Miscellaneous Provisions; Article 2/ Protection for Whistleblowers.

18.18.6 Definitions

NRC: Nuclear Regulatory Commission

SRSO: Statewide Radiation Safety Officer

Protected Activity: Is when a Concerned Individual (CI) identifies and communicates a safety concern regulated by the NRC or other government agency (i.e. OSHA). The protection applies if the CI communicates the concern to co-workers, supervisors, the NRC, another government agency, Congress, or the Media. Types of concerns can be reporting of, refusing to engage in, requesting an investigation of, or testifying on, unsafe work practices.

Adverse Action: Action initiated by the employer that detrimentally affects the employee's terms, conditions or privileges of employment. They can include any action that involves involuntary changes in the CI's employment. Examples are but not limited to termination, demotion, denial of a promotion, lower performance appraisal, or transfer to a less desirable job.

Retaliation: Occurs when an adverse action is taken against a CI that is legally engaged in protected activities. The employer/decision maker must have knowledge of the protected activity and a cause and effect connection is made between the protected activity and adverse action.

Employee Safety Concerns Program (ECP): An alternative process for a CI to report safety concerns and seeks an impartial review of the concern. The Program is appropriate if an employee is uncomfortable with direct management interface or desires confidentiality.

18.18.7 Training

Content

The training will address the following points:

1. NRC Employee Protection regulations and other applicable federal and state laws pertaining to whistleblower protection.
2. DOT&PF policies and procedures for maintaining a safety conscious work environment. Roles and responsibility of the statewide and regional radiation safety officers in assuring compliance with NRC radiation safety requirements.

Frequency

- Nuclear Gauge Users: Those involved in the use of radioactive materials will receive SCWE training as a part of the initial eight hour nuclear gauge users training and HAZMAT refresher training every two to three years.
- Supervisors: Training will be provided for supervisors of nuclear gauge users and those providing nuclear gauge program oversight on a rotating basis. Specifically:
  a. SCWE training will be provided at the annual regional construction season project engineer meetings.
  b. The intended training session will occur in the Northern Region in the spring of 2009, followed by Southeast Region and Central Region in years 2010 and 2011.
  c. Starting in year 2012, training will be provided in each region every third year on a rotating basis.

Trainer Qualifications

Individuals performing the training shall have received:

- 40 hour safety-related course (HAZMAT, RSO, OSHA)
- DOT&PF SCWE training course

18.18.8 Communication

Posters with pertinent SCWE information shall be placed on all project office bulletin boards. Information shall include:

1. Definition of SCWE; 18.18
2. DOT&PF policy statement;
3. Contact information for the Employee Safety Concerns Program, State and Federal Agencies.

The SRSO will publish an annual newsletter at the beginning of the construction season for the Nuclear Gauge Users. Information shall include:

1. Definition of SCWE;
2. Lessons learned and/or case studies;
3. Updates on any changes to the Radiation Protection Program and/or SCWE Program;
4. Contact information for the Employee Safety Concerns Program, State and Federal Agencies;
5. Recognition of employees for raising concerns (with their permission);
6. Other pertinent items of interest.

Management Notification of Concerns

The goal of DOT&PF's SCWE Program is to create and maintain an environment where employees feel free to raise concerns without fear of retaliation. Each employee is responsible to see that management is notified promptly of a safety concern. This does not restrict the avenue used to inform management. Employees are free to use alternate channels of communication if desired. Means of communicating a concern include the following:

a. Direct Supervisor. Addressing a safety issue informally through the direct supervisor or any member of the management chain is often the most efficient avenue.

b. Employee Safety Concerns Program (ECP). If an employee is uncomfortable with management or desires confidentiality, the employee may contact the Statewide Safety Officer or the Statewide Radiation Safety Officer through the Employee Safety Concerns Program. The ECP provides an employee an alternate route to raise and resolve a concern. See Alaska Employee Safety Concerns Program Manual.

c. Human Resources.

d. Regulatory Authority.

Program Responsibilities

Directors and Chiefs are responsible for:

1. Implementing DOT&PF's SCWE Program in their work areas through demonstrated behaviors by:
   a. Availability

b. Receptiveness
c. Sensitivity
d. Communications
e. Timeliness
f. Responsiveness
g. Safety-first focus

2. Ensuring that employees are offered training in the policies and practices of SCWE.
3. Ensuring that managers and superintendents are aware of their responsibilities for raising concerns and where to go to do so; receiving and addressing concerns in a positive, objective, and professional manner; and acting quickly on allegations of harassment, intimidation, retaliation or discrimination with appropriate help.

Managers, Superintendents, Foremen and Leads are responsible for:

a. Encouraging employees to bring safety concerns forward by being available and having an open-door policy in the office and in the field;
b. Being sensitive to an employee's potential reluctance to raise concerns and, therefore the need to protect their identity or the identity of others involved;
c. Receiving concerns by listening and restating the concern, making sure they understand what the concern is;
d. Ensuring that employees are trained in SCWE;
e. Familiarizing themselves with the SCWE Program;
f. Receiving and addressing concerns in a positive, objective, and professional manner; and acting quickly on allegations of harassment, intimidation, retaliation or discrimination with appropriate help.

Statewide Safety Officer is responsible for:

1. Coordinating supervisor training;
2. Performing reviews of the SCWE Program and updating, if required;
3. Providing support and assistance to all employees with safety issues that may arise.

Regional Radiation Safety Officer is responsible for:

1. Coordinating nuclear gauge user training;
2. Providing support and assistance for safety issues involving nuclear gauges.

Workers are responsible for:

- Following all safety instructions and carrying out work duties in a safety-conscious manner;
- Timely reporting all safety related incidences or concerns.

18.18.9 Self Assessment

Department Management shall make or cause to be made, an assessment of the effectiveness of the policies and procedures detailed in this Program. The self-assessment shall consist of one or more of the following methods:

- Lessons Learned Evaluation: to determine if lessons learned from internal and external sources are shared in a timely manner;
- Benchmarking: to determine best practices in industry;
- Performance Indicators: to track how we are doing;
- Survey and Interviews: to determine program effectiveness;
- Direct Behavior Observations: as part of normal supervisory responsibilities.

18.18.10 Program Review

The Statewide Safety Officer in conjunction with the commissioner, or designee, will review the SCWE Program and relevant publications on an annual basis. Where deficiencies are found or enhancements identified, corrective action will be developed as appropriate.