



CONSTRUCTION EQUIPMENT AND METHODS: CONSTRUCTION SAFETY

Goals and Objectives of this Lecture

Goal:

To provide the students with examples of standard types of construction equipment, construction methods, and construction safety and discuss how these are applied to any civil engineering project.

Objectives:

- 1. Not to make you an expert. It takes many years to understand the laws and how they apply to individual project circumstances.***
- 2. Think about the construction implications of a project. How is that incorporated into the project planning, design, and budgeting of a project.***
- 3. Awareness of another element of civil engineering as a profession.***

LECTURE OUTLINE

- 1. Project Planning***
- 2. Construction Equipment***
- 3. Construction Methods and Products***
- 4. Construction Safety***
- 5. Case Studies***

1. Project Planning

- 1. Visit the site with construction manager prior to bidding***
- 2. Accurate quantity take-off and material pricing, approval***
- 3. Choose proper equipment for the project***

Equipment comes in all sizes, shapes, and configurations to do any job

Every project must be analyzed to determine the construction sequence (approach), identify equipment needs

Page 37 – Mass Diagram

Trucking: haul distance, number of trucks, production, costs

Construction Access and Material Staging

CONSTRUCTION SEQUENCE FOR EROSION CONTROL

1. Notify Pennsylvania One-Call System, Inc. at least three days prior to the start of any construction activity. Mark all existing underground utilities.
2. Install Rock Construction Entrance and staging area, maintaining stone stockpiles, as necessary.
3. Install silt socks in all existing catch basins within the work area along the sidewalk and/or new parking areas.
4. Install silt fence at all locations, as shown on the plans.
5. Prepare the topsoil stockpile area and place all remaining fabric fence, as shown on plans.
6. Install rain garden, and outlet structure. Contractor to minimize soil compaction of the bottom of the pond and rain garden. Follow the General Construction Installation Sequence for Rain Garden Installation. Immediately stabilize side slope with seed and mulch.
7. Perform earthwork for the project and begin building construction. Immediately stabilize parking areas and new paving/concrete areas with stone base.
8. Install the playing field under drains and R-3 rip-rap aprons in areas shown on the plans. Continue rough grading.
9. Seed and mulch all disturbed areas with temporary seed mix for the areas that will sit idle for 20 days or more.
10. As the earthwork is completed to final grade, permanently seed and mulch disturbed areas in accordance with manufacturer or nursery recommendations for the time of the year. Any areas to remain disturbed during the non-growing must be protected by the erosion controls outlined in this plan.
11. Fine grade parking areas, pedestrian areas and install pavement.
12. Remove temporary BMPs only after final stabilization is complete and the site has achieved the required uniform 70% stabilization of an erosion resistant perennial grass species.
13. Contractor is responsible for disposal of all E&S materials in a proper manner.

Source of Supply Forms

1. Required for all state/federal funded projects.
2. Detailed breakdown of all the materials for a project.
3. Materials only from approved suppliers.

MATERIAL SOURCE OF SUPPLY AND SUB-CONTRACTOR APPROVAL					
4180 41 Shewen Avenue, Sharon, PA 16148 Voice (724) 961-8820 Fax (724) 961-4515					
130 7th Street, Suite 630, Pittsburgh, PA 15222 Voice (724) 961-8020 Fax (724) 961-4515					
Contractor's Name: Wallace & Pincus, Inc. Address 1: 1305 S. Hermitage Rd. City: State & Zip: Hermitage, PA 15106 Phone: (724) 961-0106 Fax: (724) 961-0106					
Architect: H&EER Architects / Engineers Job Name: PHEDR (Project Number) Project No.: Contract: Contract Name, Volume Name, etc: Internal Job No.: (Contractor's Job Number)					
BASE BID					
Item No.	Spec Number	Type of Material or Work	Check one	Name & Address of Mfg. or Sub-Contractor	For Architect's Use Only
			Mfg.	Sub-Contractor	
1		Tree Removal	X		
2		Demol (concrete path, fence)	X	Tim James Ford & Tree Service, 3600 Lester Wallace & Pincus, PA 15106	
3		Clearing/Grubbing	X	Tim James Ford & Tree Service, 3600 Lester Wallace & Pincus, PA 15106	
4		Construction Layout	X	Wallace & Pincus, Inc., 1305 South Hermitage Rd., Hermitage, PA 15106	
5		18" Silt Fencing	X	Knick-Knack Equipment Co., Inc., 3001 West 17th St., Erie, PA 16508	
6		30" Silt Fencing	X	Knick-Knack Equipment Co., Inc., 3001 West 17th St., Erie, PA 16508	
7		Excavation	X	Wallace & Pincus, Inc., 1305 South Hermitage Rd., Hermitage, PA 15106	
8		12" HDPE Pipe	X	Law Enterprises, Inc. P.O. Box 348 Pottsville, PA 17855	
9		18" HDPE Pipe	X	Law Enterprises, Inc. P.O. Box 348 Pottsville, PA 17855	
10		4" PVC Pipe	X	Pipelines, Inc., 700 Cherry St., Brookfield, OH 44007	
11		6" PVC Pipe (under drain)	X	Pipelines, Inc., 700 Cherry St., Brookfield, OH 44007	
12		Silt Sock	X	Pipelines, Inc., 700 Cherry St., Brookfield, OH 44007	
13		2" of Concrete Catch Basins	X	Pipelines, Inc., 700 Cherry St., Brookfield, OH 44007	
14		Cashed Limestone (under brick pavers)	X	Tray Sand & Gravel, 3340 US 422, New Castle, PA 16101	
15		AGS10 2A Stone (drill and parking lot)	X	Tray Sand & Gravel, 3340 US 422, New Castle, PA 16101	
16		#57 limestone (stone wall and catch basins)	X	Tray Sand & Gravel, 3340 US 422, New Castle, PA 16101	
17		#1 stone (construction entrance)	X	Tray Sand & Gravel, 3340 US 422, New Castle, PA 16101	
18		#1 stone (for filtration island)	X	Tray Sand & Gravel, 3340 US 422, New Castle, PA 16101	
19		Red 40 Rip	X	McDonough Supply & Transit Co., Inc. 396 Centre Rd., Pottsville, PA 17855	
20		Blum Stone	X	McDonough Supply & Transit Co., Inc. 396 Centre Rd., Pottsville, PA 17855	
21		Geotextile	X	Pipelines, Inc., 700 Cherry St., Brookfield, OH 44007	
22		Asphalt Paving (for stepping)	X	Blake Paving Co. 2349 New Butler Rd., Rt 422 New Castle, PA 16101	
23		Concrete Headwalks	X	Poland Concrete	
24		Concrete Post/curbing	X	F & C Concrete 1029 Lomer Rd., Mercer PA 16137	
25		8" Pipe Bellends (2 ea)	X	Chatham Steel Service Company 6800 Broadway, Area P.O. Box 120 West Middlesex, PA 16158	
26		Construction street signs	X	Wash Equipment	
27		Street Signs	X	Wash Equipment	
28		Block Pavers	X	Soil Builders Supply 2100 Lomer Rd., Hermitage, PA 15106	
29		Ball (pavers, clean, install)	X	Multi Media Striping, Inc. 3600 New Castle Rd., Pottsville, PA 17855	
30		Terrace Placement	X	McDonough Supply & Transit Co., Inc. 396 Centre Rd., Pottsville, PA 17855	
31		Mulch/Straw	X	Kyrosak Nursery Center 3525 East Penn Street Hermitage, PA 15106	

BASE BID		Check via	Sub-Contractor	Name & Address of Mfr. or Sub-Contractor	For Architect's Use Only
31	Great L. Oak Seed Mix	X		Leeco 180 Victoria Road Austintown, OH 44010	
32	Breton Seed Mixture	X		Farmer Conservation Seed LP 9000 Manser Pike Mapleville, PA 16256	
33	Starter Fertilizer (50 lb bags 10-04-02)	X		Leeco 180 Victoria Road Austintown, OH 44010	
34	Breton Control Blankets	X		Pipelines, Inc. 7602 Cherry St. Brookfield, OH 44020	
35	Lawn Maintenance	X		Walsdorf & Puchner, Inc. 10000 Locust Heritage Rd. Mapleton, PA 16148	
36	White Pine 2"	X		Kroynek Nursery Center 2028 East State Street Herkimer, PA 16149	
37	Rumex-cran Beach 2.5"	X		Elster Nursery, Prospect PA 16062	
38	Red Oak 2.5"	X		Kroynek Nursery Center 2028 East State Street Herkimer, PA 16149	
40	Cleveland Select Pear 2.5"	X		Elster Nursery, Prospect PA 16062	
41	Saucer Magnolia 6"	X		Kroynek Nursery Center 2028 East State Street Herkimer, PA 16149	
42	Red Baron Crabapple 1.5"	X		Elster Nursery, Prospect PA 16062	
43	Green Mountain Sugar Maple 2.5"	X		Elster Nursery, Prospect PA 16062	
44	Pin Oak 2.5"	X		Kroynek Nursery Center 2028 East State Street Herkimer, PA 16149	
45	River Birch 3" Multi-trunk	X		Kroynek Nursery Center 2028 East State Street Herkimer, PA 16149	
46	Fountain Grass 2gal	X		Kroynek Nursery Center 2028 East State Street Herkimer, PA 16149	
47	Parrotilla Grass 2gal	X		Kroynek Nursery Center 2028 East State Street Herkimer, PA 16149	
48	Highbush Cranberry Viburnum 36"	X		Kroynek Nursery Center 2028 East State Street Herkimer, PA 16149	
49	Oak Leaf Hydrangea 36"	X		Kroynek Nursery Center 2028 East State Street Herkimer, PA 16149	
50	Japanese Silvergrass 2gal	X		Kroynek Nursery Center 2028 East State Street Herkimer, PA 16149	
51	Hikoki Tree 24"	X		Kroynek Nursery Center 2028 East State Street Herkimer, PA 16149	
52	Double Grown Brown Mulch	X		Kroynek Nursery Center 2028 East State Street Herkimer, PA 16149	
53	Tree Shaping Materials	X		Tractor Supply Co. 2006 E. State St. Herkimer, PA 16149	
54	Soil	X		L. Colvin James & Company 1744 Blair Center Drive P.O. Box 109 Carrollfield, OH	
55	Mobilization				
56	Density Tests	X		ACA Engineering, Inc. 660 E. Western Reserve Rd. Independence, OH 44131	
57	Overseeding				
58	Subgrade Geotextile Stabilization	X		Pipelines, Inc. 7602 Cherry St. Brookfield, OH 44020	
59	Stone (24-in) F8 (91 Stone)	X		McQuay-Norris Road Paving Co. Inc. 200 Centre Rd. Piquetteville, OH 45351	
60	Quadrant Stone (18-in) F8 (91)	X		Lane Quarries, Inc. P.O. Box 100 Piquetteville, PA 16143	
61	Schurforn Steiner Drain Piping	X		Pipelines, Inc. 7602 Cherry St. Brookfield, OH 44020	
62	Blowdown Test	X		ACA Engineering, Inc. 660 E. Western Reserve Rd. Independence, OH 44131	
63	Concrete Sidewalks	X		F & C Concrete	

10/27/2008

HIEDER Architects / Engineers

2 of 3

BASE BID		Check via	Sub-Contractor	Name & Address of Mfr. or Sub-Contractor	For Architect's Use Only
14	Ornamental Ballards	X		Harbinger Lighting 550 Lammoria Ave. Nevada, N. 80721	

Contractor's Station

046

Condition #1 -

Condition #2 -

Condition #3 -

Condition #4 -

Condition #5 -

Condition #6 -

Condition #7 -

Condition #8 -

Condition #9 -

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Construction
Access



Material Staging





Excess cut material
stockpile area.

Site cleanup



2. Construction Equipment

- 1. Virtually any piece of equipment for any job***
- 2. Equipment is specialized for various industries (e.g. earthwork, buildings, bridges, etc.)***
- 3. Choose proper equipment for the project***

Page 46 – Excavators

Page 60 – Clamshells

Page 95, 119 – Bull Dozers, loaders, trucks









3. Construction Methods and Products

- 1. Many varieties of the same product are available***
- 2. Need to use quality products that are approved for use***
- 3. Need to understand the uses and limitations of products***

Weather and
subsoil
stabilization

geogrid

















4. Construction Safety

Occupational Safety and Health Administration (OSHA)

<http://www.osha.gov/>

Agency under the U.S. Department of Labor

OSHA's mission is to assure the safety and health of America's workers by setting and enforcing standards; providing training, outreach, and education; establishing partnerships; and encouraging continual improvement in workplace safety and health

Funding is provided through the fines generated from workplace violations


OSHA has 1,100 inspectors for 8.9 million sites throughout the US = 8,091 sites/inspector (website)



PART 2

Construction


- Hazardous Waste
- Buried building foundations
- Abandoned pipes
- Petroleum contaminated soils from pipes
- Constricted Right-of-Way
- Construction Sequencing (bridge project)
- Invasive Plants, Coal fines prohibited plant success
- Weather
- Proper material size



10/14/2005

Construction

- Existing conditions



10/14/2005



10/14/2005

Construction

- Existing conditions
- Sediment loading
- Flashy urban stream



01/25/2006 04:15 pm

Construction

Material Selection

- Size of boulders
- PennDOT approved material suppliers



Construction



- Surveying
- Sequence of construction
- Surprises



Construction



- Surveying during construction is very important



Underground Petroleum product oozing out of pipes with lead contamination



Hazardous waste containment area





Construction

- Cross Vane Installation





- Erosion and Sediment Pollution Controls are required by state law



Construction



Construction



Construction







Construction



Questions