

CONSTRUCTION SPECIFICATION

SUBCONTRACT NO.
PROJECT FILE NO. 021052

OU7-10 Glovebox Excavator Method Project Site Development

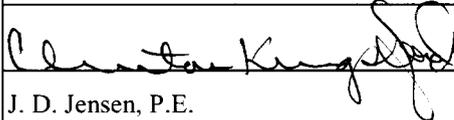
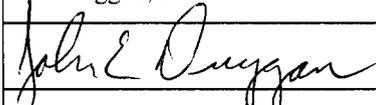
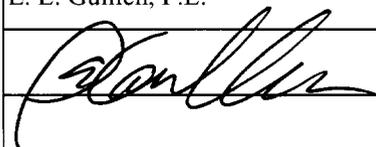
Prepared for:
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Idaho Operations Office
Idaho Falls, Idaho



**DOCUMENT MANAGEMENT CONTROL SYSTEM (DMCS)
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Author: <u>C. O. Kingsford, P.E.</u>	Phone: <u>6-0545</u>
Document Owner: <u>S. A. Davies, P.E.</u>	Phone: <u>6-4789</u>

REVIEW CONCURRENCE AND APPROVAL SIGNATURES
Denote R for review concurrence, A for approval, as appropriate.

Type or printed name	R/A	Date	Organization Discipline	Mailing Address
Signature				
S. A. Davies, P.E.	A		6710	MS 3650
		4/16/02	Project Engineer	
C. O. Kingsford, P.E.	A		6770	MS 3650
		4.16.02	Civil Engineer	
J. D. Jensen, P.E.	A		6770	MS 3670
		4/16/02	Fire Protection and Life Safety Engineer	
J. E. Duggan, P.E.	A		6770	MS 3650
		4/16/02	Electrical Engineer	
L. E. Guillen, P.E.	A		6770	MS 3920
		4/16/02	Mechanical Engineer	

**SPECIFICATIONS
FOR
OU7-10 GLOVEBOX EXCAVATOR METHOD PROJECT
SITE DEVELOPMENT**

Prepared for:

**U. S. DEPARTMENT OF ENERGY
IDAHO OPERATIONS OFFICE**

Idaho Falls, Idaho

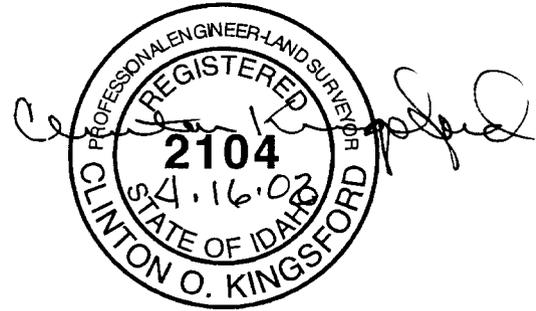
**Subcontract No.
Project File No. 021052**

April 2002

**BECHTEL BWXT IDAHO, LLC (BBWI)
Idaho Falls, Idaho 83415**

**OU 7-10 Glovebox Excavator Method
Project Site Development**

The following Sections of this Specification were prepared under the direction of the Professional Engineer as indicated by the seal and signature provided on this page. The Professional Engineer is registered in the State of Idaho to practice Civil Engineering.



Division 1 -- General Requirements

- 01005 -- Summary of Work
- 01051 -- Construction Surveying and Staking
- 01300 -- Submittals

Division 2 -- Site Work

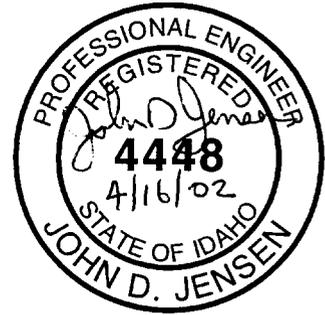
- 02200 -- Earthwork
- 02486 -- Revegetation

Division 3 -- Concrete

- 03300 -- Cast in Place Concrete
- 03400 -- Precast Concrete

**OU 7-10 Glovebox Excavator Method
Project Site Development**

The following Sections of this Specification were prepared under the direction of the Professional Engineer as indicated by the seal and signature provided on this page. The Professional Engineer is registered in the State of Idaho to practice Fire Protection Engineering.

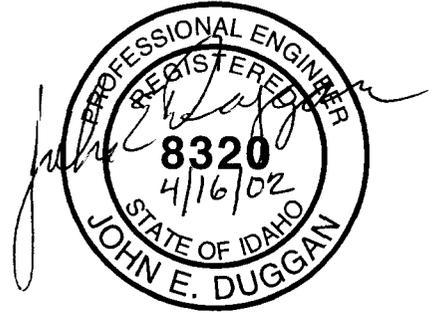


Division 13 -- Special Facilities

- 13505 -- Underground Fire Protection Piping
- 13911 -- Dry Pipe Fire Protection System
- 13914 -- Manual Deluge Systems (Fire Hydrant and Fixed Nozzle)

**OU 7-10 Glovebox Excavator Method
Project Site Development**

The following Sections of this Specification were prepared under the direction of the Professional Engineer as indicated by the seal and signature provided on this page. The Professional Engineer is registered in the State of Idaho to practice Electrical Engineering.



Division 16 -- Electrical

- 16000 -- Electrical General Provisions
- 16110 -- Electrical Raceways
- 16120 -- Cable, Wire, Connectors and Miscellaneous Devices
- 16124 -- Insulated Medium Voltage Cable and Connectors
- 16360 -- Disconnect Switches 600 V and Less
- 16450 -- Grounding
- 16603 -- Automatic Transfer Switch, Delayed Transition Type

TABLE OF CONTENTS
OU7-10 Glovebox Excavator Method Project

<u>TITLE</u>	<u>Number of pages in Section</u>
<u>DIVISION 1 - GENERAL REQUIREMENTS</u>	
01005 SUMMARY OF WORK.....	3
01051 CONSTRUCTION SURVEYING AND STAKING	3
01300 SUBMITTALS	11
<u>DIVISION 2 - SITE AND CIVIL ENGINEERING</u>	
02200 EARTHWORK.....	7
02486 REVEGETATION.....	3
<u>DIVISION 3 - CONCRETE</u>	
03300 CAST IN PLACE CONCRETE	13
03400 PRECAST CONCRETE.....	5
<u>DIVISION 5 - METALS</u>	
05100 STRUCTURAL STEEL AND MISCELLANEOUS METALS	6
<u>DIVISION 9 - PAINTING</u>	
09900 PAINTING.....	6
<u>DIVISION 13 - SPECIAL FACILITIES</u>	
13117 TEMPORARY FIRE RISER BUILDING	9
13505 UNDERGROUND FIRE PROTECTION PIPING	8
13911 DRY PIPE FIRE PROTECTION SYSTEM.....	9
13914 MANUAL DELUGE SYSTEMS (FIRE HYDRANT AND FUTURE RCS)	8
<u>DIVISION 16 - ELECTRICAL</u>	
16000 ELECTRICAL GENERAL PROVISIONS.....	4
16110 ELECTRICAL RACEWAYS.....	3
16120 CABLE, WIRE, CONNECTORS AND MISCELLANEOUS DEVICES.....	5
16124 INSULATED MEDIUM VOLTAGE CABLE AND CONNECTORS	5
16360 DISCONNECT SWITCHES 600 V AND LESS	3
16450 GROUNDING	3
16603 AUTOMATIC TRANSFER SWITCH, DELAYED TRANSITION TYPE.....	3

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

**Document Type: Construction Specification
SPC Number: 352, Revision 1**

Project Number: 021052

1 SECTION 01005--SUMMARY OF WORK

2

3 PART 1--GENERAL

4

5 SUMMARY:

6

7 The Subcontractor shall furnish plant, labor, material, equipment, and supplies (except
8 Government-furnished materials and equipment) and perform work and operations necessary
9 to install the components of the Site Development phase of the OU7-10 Glovebox Excavator
10 Method Project, in accordance with the subcontract drawings and these specifications.

11

12 Work includes, but is not limited to:

13

14 Grading, leveling, excavation, and other earthwork. Construction of reinforced
15 concrete slabs for the Fire Riser Building and grounding mat and a riprap valley drain
16 adjacent to the Fire Riser Building. Installation of utilities to the new Fire Riser
17 Building, within the Fire Riser Building and from the fire riser to the proposed
18 process facility location (interior and exterior). Installation of all associated
19 mechanical, piping, and electrical work.

20

21 REFERENCES:

22

23 The following documents, including others referenced therein, form part of this Section to
24 the extent designated herein.

25

26 CODE OF FEDERAL REGULATIONS (CFR)

27

28 29 CFR 1910 OSHA Occupational Safety and Health Standards

29 29 CFR 1926 OSHA Health and Safety Standards for Construction

30

31 BECHTEL BWXT IDAHO, LLC (BBWI)

32

33 Subcontractor Requirements Manual

34

35 Unless otherwise specified, references in these specifications or on the subcontract drawings
36 to other specifications, codes, standards or manuals which are part of these specifications, but
37 not included herein, shall be the latest edition, including any amendments and revisions, in
38 effect as of the date of this Specification.

39

40

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

**Document Type: Construction Specification
SPC Number: 352, Revision 1**

Project Number: 021052

1 SUBMITTALS:

2

3 See Section 01300, Submittals and the Vendor Data Schedule for additional submittal
4 requirements.

5

6 QUALITY ASSURANCE:

7

8 Quality Assurance Program requirements shall exist to assure that work performed is in
9 conformance with the requirements established by the drawings and this specification. QA
10 Program criteria applicable to this scope of work is addressed in SC-5 of the Special
11 Conditions and these specifications.

12

13 Standard Products: The materials and equipment furnished by the Subcontractor shall be
14 standard products of manufacturers regularly engaged in the production of the type of
15 materials and equipment required and shall be of the manufacturer's latest standard designs.

16

17 Where two or more units of the same type and class of material or equipment are required,
18 the units shall be the product of the same manufacturer, and shall be identical insofar as
19 possible. The component parts of a unit of equipment need not be the products of the
20 manufacturer.

21

22 Repair of Damages: Construction materials and equipment, flange facings, threads,
23 machined or painted, and other exposed finished surfaces shall be protected from damage at
24 all times during shipping, handling, construction and installation. Materials and equipment
25 repaired or replaced by the Subcontractor shall be subject to acceptance by the Contractor.

26

27 SAFETY, HEALTH AND ENVIRONMENT:

28

29 In general, work shall be in compliance with the applicable sections of 29 CFR 1910, 29 CFR
30 1926 and the BBWI Subcontractor Requirements Manual.

31

32 DELIVERY STORAGE AND HANDLING

33

34 All materials normally packaged shall be delivered to the site in the original, unopened
35 packages with labels intact. Upon arrival, the Subcontractor shall inspect the materials or
36 equipment for damage.

37

38 Materials and equipment shall be stored and handled in accordance with the manufacturer's
39 instructions.

40

41

Project Title: OU7-10 Glovebox Excavator Method Project
Site Development
Document Type: Construction Specification **Project Number:** 021052
SPC Number: 352, Revision 1

1 PART 2--PRODUCTS

2
3 MATERIALS:

4
5 New Materials and Equipment: Materials and equipment received by the Subcontractor in a
6 damaged condition shall be repaired or replaced by the Subcontractor as directed by the
7 Contractor. Materials and equipment damaged by the Subcontractor shall be repaired or
8 replaced by the Subcontractor.

9
10 Hazardous Chemicals and Substances: The Subcontractor shall comply with applicable
11 requirements of 29 CFR 1926.59, Hazard Communication Standard.

12
13 PART 3--CONSTRUCTION AND INSTALLATION

14
15 General: Materials and equipment shall be erected or installed only by qualified personnel
16 who are regularly engaged in the trades required to complete the work. The subcontract
17 drawings show the general arrangement and space allocation of the equipment specified. It
18 shall be the Subcontractor's responsibility to verify changes in conditions or rearrangements
19 necessary because of substitutions for specified materials or equipment. Where
20 rearrangements are necessary the Subcontractor shall, before construction or installation,
21 prepare and submit drawings of the proposed rearrangement for approval.

22
23 Coordination of Work: Where new work and existing facilities are shown on the drawings,
24 but are not located precisely by dimensions, the Subcontractor shall be responsible for proper
25 location and clearances and for correcting discrepancies and interferences in the work which
26 are a result of his operations. Work done by one trade that must be integrated with work of
27 other trades shall be laid out with due regard to the work done, or to be done, by other trades;
28 particularly if the work done by one trade depends upon completion or proper installation of
29 work done by other trades. The Subcontractor shall cooperate in coordinating his work with
30 work being done by others if their work must be integrated with the Subcontractor's work.
31 The Subcontractor shall notify the Contractor at least one week prior to starting of the date on
32 which the Subcontractor proposes to proceed with the work.

33
34 Workmanship: Work shall be done in a skillful and workmanlike manner. The
35 Subcontractor shall do structural cutting, fitting, patching, repairing and associated work
36 necessary for installation of equipment, piping and electrical conduits, etc. No major cuts or
37 holes, not shown on the drawings, shall be made without prior approval of the Contractor.
38 After the equipment and/or piping is installed, exposed holes, cracks and other defects shall
39 be neatly patched and the patched areas shall match the adjoining materials and finish.

40
41 END OF SECTION 01005

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

**Document Type: Construction Specification Project Number: 021052
SPC Number: 352, Revision 1**

1 SECTION 01051--CONSTRUCTION SURVEYING AND STAKING

2
3 PART 1--GENERAL

4
5 SUMMARY:

6
7 Work includes, but is not limited to:

8
9 Establish horizontal and vertical control, slope staking, set grade-finishing stakes,
10 building pad, building and structure controls.

11
12 SUBMITTALS:

13
14 Submittals include but are not limited to the following:

15
16 Certification: Submit certification that the land surveyor is a registered professional in the
17 State of Idaho.

18
19 See Section 01300, Submittals and Vendor Data Schedule for additional requirements.

20
21 QUALITY CONTROL:

22
23 Qualifications: Construction surveying and staking shall be accomplished under the
24 direction of a registered professional land surveyor in the State of Idaho.

25
26 PART 2--PRODUCTS

27
28 Stakes: Identification stakes and hubs shall be of sufficient length, width and depth to
29 provide a solid set in the ground and to provide space for marking above ground when
30 applicable. The top 2-in. of all slope, guard, reference, clearing, and structure stakes shall be
31 painted or marked with plastic flagging.

32
33 PART 3--EXECUTION

34
35 SURVEY REQUIREMENT:

36
37 Precision: Precision and accuracy requirements are contained in Table 1. The following
38 precisions shall be used:

39
40 Slope Staking Precision B
41 Finish Staking, Road - Precision B
42 Finish Staking, WES Building Pad and pad for Fire Riser Building - Precision A
43 Fire Water Lines - Precision A

44
45 Control: Existing control monuments are shown on the drawings.

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

**Document Type: Construction Specification
SPC Number: 352, Revision 1**

Project Number: 021052

1 Slope Stakes, Clearing Limits and Reference Stakes: Slope catch-points, clearing limits, and
2 slope reference stakes shall be established. The position of these stakes shall be determined
3 by methods that will produce on the ground the precisions shown in the Table 1.
4

5 Clearing limits shall be set within the tolerance shown in the Table 1. The clearing limit
6 shall be located on the ground and marked with lath, flagging, or other methods approved by
7 the Contractor's Representative.
8

9 The elevation and location of slope reference stakes shall be verified for accuracy by a
10 differential level run over the reference stakes between benchmarks.
11

12 Monuments of Property Boundaries or Surveys of Other Agencies: If property boundary or
13 survey monuments, or survey markers of other agencies, are found within or adjacent to the
14 construction limits, the Subcontractor shall immediately notify the Contractor's
15 Representative. These monuments shall not be disturbed.
16

17 Grade Finishing Stakes: Finishing stakes are required on the road, WES building pad, the
18 fire riser pad, and the firewater line. Stakes shall be set on 50-ft stations on the road. On the
19 edges and longitudinally down the middle of the WES building pad. Finish stakes shall be
20 set at 50 ft stations on the firewater lines.

Project Title: OU7-10 Glovebox Excavator Method Project
Site Development
Document Type: Construction Specification **Project Number:** 021052
SPC Number: 352, Revision 1

1

TABLE 1. CROSS SECTION AND SLOPE-STAKE PRECISION

Item	Precision		
	A	B	C
Cross section topography measurements shall be taken so that variations in ground from a straight line connecting the cross section points will not exceed:	0.5 ft	1.0 ft	2.0 ft
Horizontal and vertical accuracy for cross-sections. In feet or percentage of horizontal distance measured from transverse line, whichever is greater.	.05 ft or 0.2%	0.15 ft or 0.6%	0.2 ft or 1.0%
Horizontal and vertical accuracy for slope stake, slope stake references, and clearing limits. In feet or percentage of horizontal distance measured from centerline or reference stake, whichever is greater.			
a. Slope reference stakes and slope stakes.			
b. Clearing limits.	0.1 ft or 0.4%	0.15 ft or 0.6%	0.2 ft or 1.0%
	1.0 ft	1.0 ft	1.0 ft

2

3

FIELD QUALITY CONTROL:

4

5

Surveillance will be performed by the Contractor's Representative to verify compliance of the work to the drawings and specifications.

6

7

8

END OF SECTION 01051

Project Title: OU7-10 Glovebox Excavator Method Project

Site Development

Document Type: Construction Specification

Project Number: 021052

SPC Number: 352, Revision 1

1 SECTION 01300--SUBMITTALS

2

3 PART 1--GENERAL

4

5 SUMMARY:

6

7 This section specifies the administrative, technical and quality requirements for Vendor Data
8 submittals. Vendor Data requirements are specified in individual specification sections or on
9 the drawings, and tabularized on a Vendor Data Schedule. In the event of conflicting
10 requirements, the submittal requirements prescribed in the individual specification section
11 shall prevail.

12

13 The Subcontractor shall submit data, drawings, and other submittals specified. If the
14 Contractor determines the Subcontractor's submittal to be incomplete or unacceptable, the
15 Subcontractor shall make a complete and acceptable submittal to the Contractor by the
16 second submission of a submittal item.

17

18 The Subcontractor shall be responsible for advising the Contractor of any submittal that may
19 be delayed and which might, if further delayed, extend completion of the project.

20

21 Section Includes, but is not limited to:

22

23 The preparation, transmittal and delivery of documents by the Subcontractor to the
24 Contractor as required in the "Submittals" subdivision of the specification sections
25 and as provided on the Vendor Data Schedule.

26

27 Related Sections: General Provisions, Subcontractor Requirements Manual, Special
28 Conditions, Drawings, Vendor Data Schedule, and other sections of these specifications
29 apply to this section.

30

31 REFERENCES:

32

33 The following documents, including others referenced therein, form part of this Section to
34 the extent designated herein:

35

36 AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

37

38 ANSI Y14.1 Drawing Sheet Size and Format

39

40 SUBMITTALS:

41

42 General Procedures: Vendor data, whether prepared by the Subcontractor or Subcontractor's
43 subtier or supplier, shall be submitted as instruments of the Subcontractor. Therefore, prior
44 to submittal, the Subcontractor shall ascertain that material and equipment covered by the
45 submittal and the contents of the submittal itself, meet all the requirements of the subcontract

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

Document Type: Construction Specification

Project Number: 021052

SPC Number: 352, Revision 1

1 specifications, drawings, or other contract documents.

2
3 Each submittal shall contain identification for each separable and separate piece of material
4 or equipment, and literature with respect to the information provided in the specification and
5 on the Vendor Data Schedule. Submittals shall be numbered consecutively for each different
6 submittal.

7
8 Vendor Data Schedule: Vendor data required by the specification sections or the drawings to
9 support design, construction, and operation of the project is identified on a Vendor Data
10 Schedule. The Vendor Data Schedule provides a tabular listing by item number, drawing or
11 specification reference, and description of the item or service. The type of submittal is
12 identified by a "Vendor Data Code", and the time required to submit the item is identified by
13 a "When to Submit" code. An "Approval" code specifies whether the submittal is for
14 Mandatory Approval or for Information Only. One copy of routine paper or electronic file
15 submittals are required; additional copies may be required by the Vendor Data Schedule.
16 Electronic file submittals are preferred. Submittals that cannot be scanned or provided
17 electronically, such as material samples, will require 6 copies for Mandatory Approval and 4
18 copies for Information Only.

19
20 Or Equal Material or Equipment Submittals: All "or equal" materials, equipment or systems
21 shall be identified and submitted for approval as required by the Subcontractor Requirements
22 Manual.

23
24 An "or equal" submittal shall contain as a minimum all operating and physical parameters
25 necessary to show that the material or equipment is equivalent to the specified material or
26 equipment. All parameters shall be specifically identified by the submitter in the proposal.
27 Exceptions or differences between the specified item and the "or equal" item shall also be
28 identified.

29
30 If an "or equal" material, equipment or system is approved, the Subcontractor shall be
31 responsible for backup material necessary to include the material, equipment or system in the
32 technical documents. In most cases this includes "red lining" a set of design drawings, and
33 specifications to provide an "Approved for Construction" set of specifications and design
34 drawings which incorporate the changes caused by the "or equal" item. These "red line"
35 drawings shall be submitted prior to use of the "or equal" item. Any calculations or other
36 backup material necessary to show that changes are adequate shall be included with the "red
37 line" drawings and specifications.

38
39 Construction Vendor Data Transmittal and Disposition Form: All vendor data shall be
40 submitted to the Contractor using the Construction Vendor Data Transmittal and Disposition
41 Form. The form provides the Subcontractor a convenient method to submit vendor data and
42 provides the Contractor a means of dispositioning the submittal. The Subcontractor shall list
43 the Vendor Data Schedule item number, a Vendor Data Transmittal tracking number (if
44 applicable), the drawing or specification number reference, a Tag Number (if applicable), the
45 submittal status (e.g., Mandatory Approval, Information Only, Re-submittal, or Or-equal),

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

**Document Type: Construction Specification Project Number: 021052
SPC Number: 352, Revision 1**

1 the Revision Level, and the item Description. The description should include the heat or lot
2 number for items requiring Certified Mill Test Reports.

3
4 Disposition by the Contractor: The Contractor's comments and required action by the
5 Subcontractor will be indicated by a disposition code on the submittal. The disposition codes
6 will be classed as follows:

7
8 (A) "Work May Proceed." Submittals so noted will generally be classed as data that
9 appears to be satisfactory without corrections.

10
11 (B) "Work May Proceed Subject to Incorporation of Comments." This category will
12 cover data which, with the correction of comments noted or marked on the submittal,
13 appear to be satisfactory and require no further review by the Contractor prior to
14 construction. Revised drawings shall be provided upon request.

15
16 (C) "Work May NOT Proceed. Revise and Resubmit." Submittals so dispositioned will
17 require a corrected resubmittal for one of the following reasons.

- 18
19 1) Submittal requires corrections, per comments, prior to final review.
20 2) Submittal data incomplete and requires more detailed information prior to
21 final review.
22 3) Submitted data does not meet specification requirements.

23
24 (D) "Received for Information Only." Submittal so dispositioned will generally be
25 classified as Information Only for as-specified material and equipment.

26
27 Mandatory Approval coded vendor data will be reviewed by the Contractor and receive an A,
28 B, or C disposition. Information Only submittals without comments will receive a D
29 disposition. A, B, and C coded dispositioned submittals will be returned to the
30 Subcontractor. D dispositioned submittals will not be returned to the Subcontractor. The
31 Contractor may provide internal review of Information Only submittals. In the event that
32 comments are generated on an Information Only submittal, the submittal may be
33 dispositioned B or C and returned to the Subcontractor for appropriate action.
34 Acknowledgment of receipt of dispositioned vendor data by the Subcontractor will not be
35 required.

36
37 The Contractor will return dispositioned submittals with reasonable promptness. The
38 Subcontractor shall note that a prompt review is dependent on timely and complete
39 submittals in strict accordance with these instructions.

40

Project Title: OU7-10 Glovebox Excavator Method Project
Site Development
Document Type: Construction Specification **Project Number: 021052**
SPC Number: 352, Revision 1

1 PART 2--PRODUCTS (SUBMITTAL REQUIREMENTS)

2
3 EQUIPMENT DATA:

4
5 Where specifically required by other sections, equipment data shall be provided. As
6 applicable and except as otherwise specified, equipment data shall include the manufacturer's
7 name and address, the model number, and specific information on performance, operating
8 curves and data, ratings, capacities, characteristic efficiencies, catalog data, equipment
9 dimensions, evidence of compliance with safety and performance standards, and other data
10 required to fully describe the equipment. Data shall be submitted in sets covering complete
11 systems or functioning units. The data shall also be identified with the tag number of the
12 equipment or device for which the data applies.

13
14 INSPECTION AND TEST PROCEDURES:

15
16 Where specifically required by other sections, inspection and test procedures shall be
17 provided. Inspection and test procedures shall include, as applicable: description of item or
18 items involved, inspection or testing to be performed, a listing of testing agency and technical
19 personnel to be used, description of equipment and facilities to be used, test prerequisites,
20 test methods, test evaluation and acceptance criteria, safety precautions, sign-off
21 requirements, methods for control and calibration of measuring and test equipment, proposed
22 test record form, references to applicable portions of the subcontract documents, and detailed
23 procedures, methods, and criteria for evaluation and acceptance. Test procedures shall be
24 prepared in accordance with the Subcontract Requirements Manual, PRD-5014 "Test
25 Control".

26
27 INSPECTION AND TEST REPORTS:

28
29 Where specifically required by other sections, inspection and test reports shall be provided
30 within 10 working days of such inspection or test. Inspection and test reports shall include,
31 as applicable: identification of material or item inspected, inspection data, functional test
32 data, date(s) and place(s) of inspection/tests, names of agencies and technicians involved,
33 references to procedures and methods used, references to applicable portions of the
34 subcontract documents, names of persons evaluating test results, identification of work
35 failing to meet inspection/test acceptance criteria, and detailed description of corrective
36 action taken. Test reports shall be provided in accordance with the Subcontract
37 Requirements Manual, PRD-5014 "Test Control".

38
39 INSTALLATION, APPLICATION, AND ERECTION INSTRUCTIONS:

40
41 Installation, application, and erection instructions shall be provided where specifically
42 required by other sections. Installation, application, and erection instructions shall be clear,
43 concise, and detailed, and shall utilize drawings and pictures to the extent necessary. The
44 instructions shall include procedures for delivery acceptance, unpacking, inspection, re-
45 packing, storage, handling, preparation of supporting work, assembly, and incorporation of

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

Document Type: Construction Specification

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SPC Number: 352, Revision 1

1 the material/equipment into the work. The instructions shall include sequences, precautions,
2 and tolerances.

3
4 In general, the Contractor's Representative will inspect the work to the criteria and
5 instructions prescribed in the manufacturer's installation, application and erection
6 instructions. The Subcontractor shall not deviate from the written instructions without prior
7 written approval and direction from the manufacturer; such approval and direction shall be
8 submitted to the Contractor as an attachment to the manufacturer's installation, application
9 and erection instructions.

10
11 MATERIAL AND EQUIPMENT LISTS:

12
13 Where specifically required by other subdivisions, material and equipment lists shall be
14 provided. Material and equipment lists shall be complete for the work specified under the
15 subdivision and shall include all materials, products, equipment, and fixtures, including
16 consumables. Lists shall include manufacturer's name and address, trade or brand name,
17 local supplier's name and address, unit quantities, and catalog numbers required to fully
18 describe the item.

19
20 OPERATION AND MAINTENANCE (O&M) MANUALS:

21
22 Where specifically required by other sections, operation and maintenance manuals shall be
23 provided.

24
25 Contents: O&M manuals for manufacturer's standard items shall, unless otherwise specified,
26 be the standard publication issued for the product by the manufacturer.

27
28 O&M manual for special engineered items or systems shall, as a minimum, contain the
29 following information when applicable, unless the information is requested and submitted
30 separately:

- 31
32 1. Cover sheet identifying the project, site, Contractor, Subcontractor and
33 identification of the specific equipment or system described therein.
34 2. Table of contents listing sections, paragraphs, subparagraphs, and the page
35 numbers where each one starts.
36 3. General introduction and overall equipment and system descriptions, including
37 purpose, function, and simplified theory of operation.
38 4. Safety considerations including load limits, voltages, capacities, speeds,
39 temperatures, and pressures.
40 5. Start-up sequence instructions, operating instructions, and instructions for both
41 normal and emergency shutdown sequences.
42 6. Recommended procedures and frequencies for preventive maintenance including
43 inspection, tests, adjustment, lubrication, and cleaning.
44 7. Required preventative maintenance and frequency to ensure warranties.
45 8. Troubleshooting, checkout, repair, and replacement procedures.

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

**Document Type: Construction Specification
SPC Number: 352, Revision 1**

Project Number: 021052

- 1 9. List of test point locations for troubleshooting, and normal operating test values at
2 each point provided.
- 3 10. List of lubricants and other consumables for each item of equipment, and
4 approximate quantities needed per year; where possible, types of consumables
5 shall be consolidated, with equipment manufacturer's approval, to minimize the
6 number of different consumables required.
- 7 11. List of tools and equipment required for testing and maintenance.
- 8 12. Complete equipment list, supplier's equipment specifications, and equipment and
9 product data.
- 10 13. Complete parts lists for each item of equipment reflecting the manufacturer's
11 name, address, and telephone number; part number, nomenclature and exploded
12 views of each assembly.
- 13 14. Spare parts list and information described in paragraph entitled "Spare Parts
14 Lists".
- 15 15. Mechanical, electrical, and instrumentation schematics and diagrams for each
16 item of equipment and the integrated systems.
- 17 16. Instrument/equipment calibration instructions, including calibration set points
18 where applicable.
- 19 17. "As-Built" drawings and shop drawings.
- 20 18. Warranties including the name, address, and telephone number of the firm
21 providing the warranty service.

22
23 O&M manuals shall be suitable for copying and microfilming.

24
25 PRODUCT DATA:

26
27 Where specifically required by other sections, product data shall be provided. Product data
28 shall include descriptive material, such as catalog data, diagrams, color charts, and other data
29 published by the manufacturer, as well as evidence of compliance with safety and
30 performance standards. To demonstrate conformance to the specified requirements; catalog
31 numbers alone will not be acceptable. The data shall include the name and address of the
32 nearest service and maintenance organization that regularly stocks repair parts.

33
34 Product data submittals shall reference the applicable subdivision and drawings, and be
35 complete for each item or unit of work.

36
37 SAMPLES:

38
39 Where specifically required by other sections, samples shall be provided. Samples shall be
40 identical with final condition of materials or products proposed for the work. Two full sets
41 of optional samples shall be provided when required. Information shall be provided with
42 each sample to show generic description, source or product name and manufacturer,
43 limitations, and compliance with standards. If requested by the Subcontractor, one sample
44 set may be returned to be incorporated in the work. If incorporated into the work such

Project Title: OU7-10 Glovebox Excavator Method Project
Site Development
Document Type: Construction Specification **Project Number:** 021052
SPC Number: 352, Revision 1

1 sample shall be labeled in an approved manner and the installed location recorded on
2 “Redline” drawings.

3
4 SHOP DRAWINGS:

5
6 Where specifically required by other sections, shop drawings shall be provided. Each shop
7 drawing submittal shall be complete and shall be accompanied by technical and performance
8 data as necessary to fully illustrate the information in the shop drawings, or cross referenced
9 to such data contained in previous submittals. Unless otherwise specified, submittals shall
10 consist of black-line printed copies. Hard copies and an electronic copy shall be submitted
11 where required by other specification sections. Electronic copies of CAD generated
12 drawings shall be provided in a form that will transfer to the Contractor’s software using
13 IGES or custom software provided by the Subcontractor. Sepia type prints are not
14 acceptable. One set of copies will be returned to the Subcontractor marked to show the
15 required corrections or approval.

16
17 The tag number indicated on the design drawings shall identify all equipment or other
18 devices on the shop drawings. The Subcontractor shall identify all equipment and devices
19 with tags or labels in accordance with the requirements specified in the respective
20 subdivision.

21
22 The following additional submittals shall be required as indicated on the Vendor Data
23 Schedule:

24
25 “Redline” Drawings: Copies of the shop drawings shall be updated to include all
26 changes or modifications made during construction and to reflect the actual
27 conditions of construction. Each drawing shall be marked "As-Built" and be signed
28 by the Subcontractor representative and shall be suitable for XEROX copying or
29 microfilming.

30
31 Title Block and Identification: On each shop drawing, a 1-1/2 x 2-1/2 in. space shall be
32 provided for the Contractor's review status stamp. Each shop drawing shall include a title
33 block showing:

- 34
- 35 1. Project name and location.
 - 36 2. Name and address of Subcontractor or manufacturer as applicable.
 - 37 3. Date, scale of drawings, unique drawing identification number, and referenced
38 design drawing number.
 - 39 4. Subcontractor’s review and approval stamp or signatures.
 - 40 5. Revision record including signatures and dates.

41
42 Preparation and Size: Details and information shall be clearly drawn, dimensioned
43 (including tolerances), noted, cross referenced and shall be of such quality as to ensure
44 legible B (11 x 17 in.) size photocopy reproductions from microfilm (by others). Drafting

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

**Document Type: Construction Specification
SPC Number: 352, Revision 1**

Project Number: 021052

1 and drawing standards shall be consistent with the practices established by ANSI Y14.1 or
2 other acceptable standards and as specified herein:
3

4 Where applicable, views shall be oriented so that plant north faces to the left or up.
5 Use of abbreviations shall be avoided where space permits spelling in full; if used,
6 abbreviations shall be described in a legend on the drawing.
7

8 Types: Shop drawings shall be of the specific types specified in the respective subdivisions.
9 If a specific type is not specified, drawing shall be the type most commonly required for the
10 specific class of work subject to the Contractor's approval. The most commonly required
11 types of shop drawings and drawing content (as applicable) are described hereinafter.
12

13 Connection Diagrams: Shall indicate the relationships and connections of devices
14 and apparatus. They shall show the general physical layout of all controls, the
15 interconnection of one system, or portion of system, with another, and all internal
16 tubing, wiring, and other devices. For simple installations, connection diagrams and
17 interconnection diagrams may be combined onto a common drawing.
18

19 Control Diagrams: Shall show the physical and functional relationship of equipment.
20 Electrical diagrams shall show size, type, of the systems. Pneumatic diagrams shall
21 be furnished where gas systems are used. For simple installations, control wiring
22 diagrams may be combined onto a common drawing.
23

24 Composite Drawings: Composite drawings shall show the work of one trade with
25 that of other trades in the same contract and the structural and architectural elements
26 of the work. Composite drawings shall be in sufficient detail to show overall
27 dimensions of related items, clearances, and relative locations of work in allotted
28 spaces.
29

30 Detail Drawings: Shall consist of dimensioned fabrication and assembly drawings for
31 all parts of the work in such detail to enable the Contractor to check conformity with
32 the contractual requirements.
33

34 Elementary Diagrams: Shall indicate, in straight-line form, without regard for
35 physical relationship, all supporting systems and elements of equipment and
36 associated apparatus.
37

38 Layout Drawings: Shall be consolidated for all trades in the subcontract, and show to
39 scale pertinent structural and fenestration features and other items, such as cabinets,
40 required for installation and which could affect the available space. Mechanical and
41 electrical equipment and accessories shall be shown to scale in plan, elevation and/or
42 section, in their installed positions. Duct work, plumbing, and piping shall also be
43 indicated. Submittals describing the various mechanical and electrical equipment
44 items, which are to be installed in areas represented by layout drawings, shall be

Project Title: OU7-10 Glovebox Excavator Method Project
Site Development
Document Type: Construction Specification **Project Number:** 021052
SPC Number: 352, Revision 1

1 assembled and submitted concurrently with and accompanied by the room layout
2 drawings.

3
4 Fabrication, Erection, and Installation Drawings: Shall indicate equipment
5 arrangement and shall include dimensions, elevations, sections, and enlarged details
6 showing proper methods of field fabrication, construction, and installation.

7
8 Interconnection Diagrams: Shall be to scale and indicate interface between
9 associated units of equipment and between equipment and systems. Internal
10 equipment connections shall be shown on the connection diagrams. For simple
11 installations, connection and interconnection diagrams may be combined onto a
12 common drawing.

13
14 Outline Drawings: Shall indicate overall physical features, dimensions, ratings,
15 center of gravity, lifting points, service requirements, and weight of equipment.

16
17 Schematic Drawings: Shall show the functional flow of systems and their interfaces
18 with facilities and other systems. Functional and physical interfaces shall be
19 indicated. Schematics need not be to scale. Schematic may be structural,
20 mechanical, electrical, instrumentation or any combination of these with respect to
21 the equipment or systems to be installed.

22
23 Single-line Diagrams: Shall indicate, by means of single lines and simplified
24 symbols, the paths and component parts of systems. Items shall be clearly labeled to
25 indicate ratings and use in the system.

26
27 Wiring Diagrams: Shall identify all terminals, terminal blocks, and wires with wire
28 numbers and colors. All wires within enclosures and all wiring connections to
29 externally located equipment and devices shall be shown. For simple installations,
30 wiring diagrams and control diagrams may be combined onto a common drawing.

31
32 Isometric Drawings: For piping systems, indicate three-dimensional piping layouts in
33 the isometric format. Piping shall be represented as a single-line and in-line
34 components shall be represented with standard drafting symbols.

35
36 SPARE PARTS LISTS:

37
38 Where specifically required by other sections, spare parts lists shall be provided. Spare parts
39 lists shall include all spare parts and the current list price of each spare part. The spare parts
40 lists shall also identify those spare parts, which each manufacturer recommends for
41 maintenance at the site. Each manufacturer or vendor shall indicate the name, address, and
42 telephone number of its spare parts source closest to the INEEL.

43

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

**Document Type: Construction Specification Project Number: 021052
SPC Number: 352, Revision 1**

1 The Subcontractor shall cross-reference all spare parts lists to the equipment tag numbers
2 designated in the specifications or on the drawings. If O&M manuals are specified for
3 equipment, spare parts lists shall be submitted as part of the O&M manual.
4

5 CALCULATIONS:
6

7 Where specifically required by other sections, calculations shall be provided. Engineering
8 calculations and analyses shall be fully checked by a qualified individual other than the
9 originator, and shall be signed and dated as checked. All final submittals of calculations
10 shall be bound and shall include the title and purpose of the calculation, a table of contents or
11 index, complete list of references, design basis and complete list of assumption (if any),
12 methodology, and sufficient information to allow independent verification of the calculation.
13

14 Calculations which are performed by computer or with computer assistance shall include a
15 description of the hardware and software used, a description of the model employed if
16 applicable, verification documentation for the computer program, and a copy of the computer
17 input and output. All revisions to submitted calculations, as a result of comments by the
18 Contractor or design changes by the Subcontractor, however minor, shall be resubmitted.
19

20 SPECIAL PACKAGING, HANDLING, OR STORAGE PROCEDURES:
21

22 Where specifically required by other sections, special packaging, handling, rigging, shipping,
23 storage, or preservation procedures shall be provided. These procedures shall contain the
24 following minimum requirements as applicable:
25

- 26 1. Measures taken to prevent damage during transit.
- 27 2. Detailed description of container design.
- 28 3. Overall dimensions and approximate weight of container and contents.
- 29 4. Recommended method for off-loading.
- 30 5. List of required special off-loading devices.
- 31 6. Special instruction for proper packaging and preventative maintenance during storage
32 at the site.
- 33 7. Special instructions for marking.
- 34 8. Safety code labels, if applicable.
35

36 INTEGRATED MANUFACTURING, INSPECTION, AND TEST PLAN:
37

38 Where specifically required by other sections, an integrated manufacturing, inspection, and
39 test plan shall be provided. The integrated plan shall itemize the manufacturing, inspection,
40 and/or test procedure steps associated with initial material preparation through end product
41 delivery. The plan shall incorporate "source inspection hold points" as specified in the
42 individual section.
43
44

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

Document Type: Construction Specification

Project Number: 021052

SPC Number: 352, Revision 1

1 PART 3--EXECUTION (NOT APPLICABLE)

2

3 END OF SECTION 01300

4

Project Title: OU7-10 Glovebox Excavator Method Project
Site Development
Document Type: Construction Specification **Project Number:** 021052
SPC Number: 352, Revision 1

1 CODE OF FEDERAL REGULATIONS

2
3 29 CFR 1926 OSHA Safety and Health Regulations for Construction,
4 Subpart P - Excavation
5

6 IDAHO TRANSPORTATION DEPARTMENT (ITD)

7
8 SSHC Standard Specification for Highway Construction
9

10 SUBMITTALS:

11
12 Product Data: Manufacturers specification data for the woven geotextile fabric.
13

14 PART 2--PRODUCTS

15
16 MATERIALS:

17
18 Satisfactory Soil Materials: Satisfactory soil materials are defined as those complying with
19 AASHTO M145, soil classification Groups A-1, A-2-4, A-2-5, and A-3.
20

21 Unsatisfactory Soil Materials: Unsatisfactory soil materials are those defined in
22 AASHTO M145 soil classification Groups A-2-6, A-2-7, A-4, A-5, A-6, and A-7; also peat
23 and other highly organic soils.
24

25 Backfill and Fill Material: "Satisfactory" soil materials free of clay, rock, gravel larger than
26 6 in. in any dimension, debris, waste, frozen materials, vegetable and other deleterious
27 matter. Select pit run gravel is available at the Borax Pit at no cost to the Subcontractor. No
28 work of any type shall occur in this pit between March 1 through May 15 without prior
29 approval. Contact S. M. Stoller Corporation at 208-525-9358 or Mike Jackson at 208-526-
30 8872. The Subcontractor shall obtain the required gravel from the pit in the location as
31 directed. The topsoil shall be removed and stockpiled and later used for reclaiming the pit.
32

33 Riprap: Riprap shall be rounded river rock or fractured basalt, 6-8 inches in diameter
34 maximum.
35

36 Sand Bedding: Sand bedding for pipe shall be 3/8-inch material in the Satisfactory Soil
37 Material Group.
38

39 Identification Ribbon: See the appropriate piping or electrical specifications for
40 Identification Ribbon requirements.
41

42 Locator Ribbon: Ribbon shall be 3 in. wide and shall be red for all electrical conduits,
43 electrical cables, and telephone cables. Yellow ribbon shall be used for all buried pipelines.
44 Ribbon shall be tape manufactured by Reef Industries or Allen Markline and shall have metal
45 foil which is completely encased in plastic and can be easily detected by metal detectors.

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

Document Type: Construction Specification

Project Number: 021052

SPC Number: 352, Revision 1

The ribbon shall be printed with the manufacturer's standard wording, "CAUTION ELECTRIC LINE BURIED BELOW," for all electrical conduits, phone lines, etc., "CAUTION BURIED PIPELINE BELOW," for all buried pipelines.

Geotextile Fabric: The geotextile fabric materials shall comply with AMOCO Geotextile #2006. The minimum physical requirements are as follows:

WOVEN GEOTEXTILE FABRIC

(Placed on Prepared Subgrade)
Table 1

Typical Properties	Test Method	Requirements
Grab Tensile Strength	ASTM D1682	315 lbs
Opening Size	CWO 2215	30-70 sieve size mm
Grab Elongation	ASTM D1682	15%
Mullen Burst	ASTM 3786	600 psi
Puncture	ASTM 3787	120 lbs
Trapezodial Tear	ASTM D2263	120 lbs
UV Resistance (strength retained)	ASTM 4355	70%

PART 3--EXECUTION

EXCAVATION:

Sand Bags: Prior to any construction, place burlap bags with rock around catch basins as shown on the plans.

Clearing and Grubbing: The roads and building pads as shown on the plans, plus 3 ft outside these areas shall be stripped and cleared of all weeds, rubbish and organic matter. All weeds and debris encountered during the stripping operations shall be removed from the cleared areas to the natural ground. Excavation of overburden shall be avoided.

Install a silt fence at the entrance of the pipe near the fire riser building in accordance with the drawings.

Earth Excavation: Earth excavation includes removal and disposal of pavements and other obstructions visible on ground surface, soil material of any classification, and other materials encountered that are not classified as rock excavation or unauthorized excavation.

Construction of drainage ditches as required shall be considered as earth excavation.

Unauthorized Excavation: Unauthorized excavation consists of removal of materials beyond indicated elevations or dimensions without specific direction by the Contractor.

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

Document Type: Construction Specification

Project Number: 021052

SPC Number: 352, Revision 1

1 Unauthorized excavation, as well as remedial work directed by the Contractor, shall be at the
2 Subcontractor's expense.

3

4 Structural: Excavations for such structures as footings, foundations, and slabs shall be made
5 to the depths shown on the drawings and of sufficient width to allow adequate room for
6 setting and removing forms, installing accessories and inspection. Where concrete
7 foundations or slabs are to be constructed on material other than rock, care shall be taken to
8 prevent disturbing the bottom of the excavation. Excavation to final grade shall not be made
9 until just before concrete forms are to be placed therein. Concrete foundations shall be
10 placed only on undisturbed soil or rock.

11

12 Shoring and Bracing: The sides of all excavations shall be sloped or securely shored and
13 braced in accordance with OSHA 29 CFR 1926, Subpart P.

14

15 TRENCH EXCAVATION:

16

17 Trenches: Trenches shall be of sufficient width to provide adequate room for workmen to
18 perform any necessary service to the materials or items being installed therein and to permit
19 proper compaction of the backfill.

20

21 Grade: The bottom of pipe trenches shall be graded to allow for a minimum of 4 in. of
22 compacted sand bedding beneath the pipe. Bell holes shall be shaped so that pipe will be
23 uniformly supported for its entire length on the compacted sand backfill. Hubs or flanges
24 shall be unsupported until the pipeline has been tested, coated, and wrapped, as required.

25

26 Stockpiling and Disposal: Excavated material that is suitable and required for backfilling,
27 grading or topsoil, shall be piled in an orderly manner a sufficient distance from the edge of
28 the trench excavation, but in no case closer than 2 ft, and so located that it will not interfere
29 with normal vehicular or pedestrian traffic. Excavated materials to be used for backfill shall
30 be kept free from vegetation and other objectionable materials. Unused excavated earth not
31 approved for backfilling, and rock waste and combustible materials shall be hauled to areas
32 designated by the Contractor and disposed of in a manner specified in the Special Conditions.

33

34 Unstable Soils: If wet or otherwise unsatisfactory soil is encountered in an excavation, at or
35 below the excavation line, it shall be brought to the attention of the Contractor and removed
36 as directed in accordance with Article 38, "Differing Site Conditions", of the General
37 Provisions. The bottom of the excavation shall then be brought to the required grade with
38 concrete or compacted backfill as specified hereinafter. Excavation of unstable soil resulting
39 from the Subcontractor's neglect to keep the excavated opening dry, and other over depth
40 excavation not required to satisfactorily complete the work, shall be brought up to the
41 required grade with concrete or compacted backfill as specified hereinafter at the
42 Subcontractor's expense.

43

44 Shoring and Bracing: The sides of all excavations shall be sloped or securely shored and
45 braced in accordance with OSHA 29 CFR 1926, Subpart P.

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

**Document Type: Construction Specification
SPC Number: 352, Revision 1**

Project Number: 021052

1 BACKFILL:

2
3 General: The excavations shall be cleared of all trash and debris prior to backfilling or
4 filling. All backfill or fill material shall be free from trash, organic matter and frozen
5 particles. Installation and testing of all piping shall be approved by the Contractor prior to
6 backfilling. Backfilling or filling shall be done only when approved by the Contractor. In
7 excavations that are shored, shoring and formwork shall be removed or raised as backfill or
8 fill is placed.

9
10 Under Footings and Foundations: Footings and foundations for columns and for heavy
11 equipment shall not be placed on earth backfill. Over depths in excavations for such footings
12 and foundations shall be backfilled with concrete. The concrete shall be in accordance with
13 the "Concrete" section of these specifications.

14
15 Under Slabs or Pavement: Backfill or fill materials under concrete slabs and floors shall be
16 compacted fill material as specified in the "Materials" section.

17
18 Placement: Concentrated dumping of backfill or fill material into excavations will not be
19 permitted. No water shall be used for placing, settling or compacting backfill or fill except to
20 obtain optimum moisture content. All material must be placed in uniform layers not to
21 exceed 8 in. loose measurement and brought up simultaneously and evenly on both sides of
22 foundation walls and around underground or covered structures and equipment such as
23 culverts, manholes, storage tanks and pipe. Backfill or fill around piping, and at least 4 in.
24 over, shall be hand placed and compacted prior to pressure testing. Care shall be taken when
25 backfilling, filling, or compacting around any buried items to prevent injury to the item being
26 covered and to prevent piercing or rupturing the probes or the geotextile fabric.

27
28 Compaction: Unless otherwise indicated on the drawings or specifications, compact all
29 backfill and fill under slabs, building pads, roads, and other surfaced areas, around
30 foundation walls, culverts and other similar structures. Unless otherwise indicated, all
31 "compacted" backfill or fill shall be compacted to at least 90% of maximum dry density at
32 optimum moisture content $\pm 2\%$ as determined by AASHTO T99. Each 8-in., maximum,
33 loose measurement lift shall be compacted before the next lift is placed thereon. Compacted
34 backfill or fill density and moisture content may be measured by the Contractor at any
35 location and depth. Sections of backfill or fill failing to meet the minimum compaction
36 requirements shall be corrected prior to placement of subsequent lifts. No heavy equipment
37 shall be allowed within 5 ft of a structure or the foundation of any structure.

38
39 Locator Ribbon: The locator ribbon shall be placed in a zone 6 to 12 in. from the ground
40 surface directly over the utility during the backfill and compaction operation.

41
42

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

**Document Type: Construction Specification
SPC Number: 352, Revision 1**

Project Number: 021052

1 PLACING PIT RUN GRAVEL FILL:

2
3 General: Construct pit run gravel fills, including the preparation of the subgrade upon which
4 the gravel is to rest, in accordance with this specification, and to the lines, grades, and typical
5 cross sections shown on the drawings.

6
7 Construction Requirements: Prior to placement of the pit run gravel, the existing subbase
8 and overburden shall be stripped of all vegetation, brought to optimum moisture content, and
9 compacted to at least 90% maximum density as determined by the AASHTO T99.

10
11 In the Pit 9 area compaction of subgrade is not required. The geotextile fabric shall be placed
12 prior to placing the pit run gravel.

13
14 Material containing excessive moisture shall be permitted to dry to a moisture content that
15 will permit the required compaction. No extra payment will be made for rehandling such
16 material to permit drying. Material that does not contain sufficient moisture to compact to
17 the required density shall be uniformly moistened as required. Upon completion of
18 operations involving backfill, the Subcontractor shall grade and reshape the disturbed areas.

19
20 PLACING GEOTEXTILE FABRIC:

21
22 The geotextile fabric shall be placed on a prepared subgrade in accordance with the
23 manufacturer's recommendations, as shown on the plans, and as directed. It is not intended
24 to do any excavation into the overburden. The only preparation of the subgrade is remove
25 weeds, sharp or projecting objects. The backfill shall be end dumped onto the fabric and then
26 pushed onto the fabric with a small dozer or loader. Compaction may be by a motorized
27 roller or a hand tamper around the probes. Circular holes may be cut into the fabric to fit
28 snugly around the probes to be covered. The geotextile fabric shall be placed one foot
29 outside the shoring shield limits as shown on the plans.

30
31 The road into the Pit 9 area and geotextile fabric will be removed on a future project.

32
33 Place geotextile fabric under each pipe support. Place 6-12" of leveling course to provide a
34 level surface for the precast support. The leveling course shall be compacted over the fabric.

35
36 PLACING PITRUN GRAVEL AROUND EXPLORATORY PROBES:

37
38 Gravel shall be hand placed around the exploratory probes which are within the gravel fill.
39 Gravel shall be compacted with a hand mechanical tamper to 90% of maximum dry density
40 in an area 2-3 ft around the probe. Care shall be taken to avoid breaking, bending, or
41 damaging the probes.

Project Title: OU7-10 Glovebox Excavator Method Project
Site Development

Document Type: Construction Specification
SPC Number: 352, Revision 1

Project Number: 021052

1 RECLAMATION OF GRAVEL PIT:

2

3 The Subcontractor shall grade and reslope disturbed areas in the gravel pit after the required
4 quantity of material has been removed. The gravel slopes shall be graded to a 4:1 slope or
5 flatter. The topsoil shall be placed over the disturbed areas and sloped surfaces and reseeded
6 in accordance with Section 02486 – Revegetation.

7

8 FIELD QUALITY CONTROL:

9

10 Surveillance will be performed by the Contractor's Representative to verify compliance of
11 the work to the drawings and specifications.

12

13 END OF SECTION 02200

14

Project Title: OU7-10 Glovebox Excavator Method Project
Site Development
Document Type: Construction Specification **Project Number:** 021052
SPC Number: 352, Revision 1

1 SECTION 02486--REVEGETATION

2
3 PART 1--GENERAL

4
5 SUMMARY:

6
7 Work includes, but is not limited to:

8
9 Preparing seedbeds, sowing grasses, applying fertilizer, and applying mulch to
10 revegetate disturbed sites in the Borax Pit.

11
12 SUBMITTALS:

13
14 No vendor data required for this section.

15
16 PART 2--PRODUCTS

17
18 MATERIALS:

19
20 Topsoil: Clean topsoil free from any toxic minerals, noxious weeds or other objectionable
21 material which has been stripped from the area to be worked.

22
23 Grass Mix: The following grass mix shall be used for disturbed areas in the Borax Pit.

24
25

SPECIES	SEEDING RATE (lbs Pure Live Seed per acre)
Indian Rice Grass "Rimrock" (<i>Achnatherum hymenoides</i>)	2
Thickspike wheatgrass "Bannock" (<i>Elymus lancolatus ssp. lanceolatus</i>)	2
Bottlebrush Squirreltail (<i>Elymus elymoides</i>)	2
Bluebunch wheatgrass "Goldar" (<i>Pseudoroegneria spicata ssp. spicata</i>)	2
Needle and thread grass (<i>Stipa comata</i>)	2
Munro globemallow (<i>Sphaeralcea munroana</i>)	1
Total	11.0

26
27

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

**Document Type: Construction Specification Project Number: 021052
SPC Number: 352, Revision 1**

1 Seedlings: In addition to the seeding above, plant 1,300 Wyoming Big Sagebrush (*Artemisia*
2 *tridentata ssp. wyomingensis*) seedlings over the disturbed area at or near 3 ft on center. The
3 seeding for the seedlings shall be collected from the INEEL near the project site. The
4 Subcontractor is advised that it takes approximately 3 months for the seedlings to germinate.
5 A known supplier of the seedlings is Bitterroot Restoration 406-961-4991. Seedlings shall be
6 installed in accordance with standard practice. (Estimated disturbed area is 12,000 sq ft.).
7

8 Fertilizer: Fertilizer shall be 16-48-0 (NPK) ammonium or diammonium phosphate. Each
9 component of the fertilizer may vary two percent.
10

11 Mulch: Mulch shall be processed grass straw free of noxious weeds and other deleterious
12 materials.
13

14 EQUIPMENT:

15
16 Seedbed Preparation: Disks, harrows, roller harrow-packers (culti-packers), tooth type
17 harrows, shovels, or other similar equipment.
18

19 Seeding and Fertilizing: Drills with double disc and agitator, ground driller hand seeder,
20 culti-packer with seed boxes, Brillion seeder, or other similar equipment. The Subcontractor
21 may use a drill owned by the Contractor if desirable.
22

23 PART 3--EXECUTION

24
25 Season of Work: Seeding shall be done between October 10 and November 30. Specific
26 ideal seeding times within these windows shall be as required for proper seedbed preparation.
27

28 Weed Control: Areas to be seeded shall be maintained reasonably free of weeds. Weeds
29 shall be kept from going to seed.
30

31 Seedbed Preparation: Soil shall be tilled a minimum depth of 4 inches. The seedbed shall be
32 firm below seeding depth and well pulverized and loose on top. It shall be free of clods and
33 weeds. Seedbed preparation shall not be performed when soil conditions are not suitable for
34 tilling: too dry, too wet, frozen, etc. Tillage shall produce cross-slope furrows on slopes.
35

36 On areas subject to severe erosion, the extent of seedbed preparation shall not exceed that
37 which can be seeded in one day.
38

39 Fertilizing: Fertilizing shall closely follow seedbed preparation. Fertilizer shall not be mixed
40 with seed. Fertilizer may be drilled or broadcast. Fertilizer shall be applied at a rate of 50
41 pounds per acre.
42

43 Seeding: Seeding shall closely follow fertilizing. If the seedbed has been disturbed, then the
44 Subcontractor shall prepare the seedbed again. Seeding work shall not proceed until the
45 seedbed has been inspected. Seeds shall be thoroughly mixed prior to application. Seeds

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

**Document Type: Construction Specification Project Number: 021052
SPC Number: 352, Revision 1**

1 shall be uniformly applied at the previously specified rate. Seeds shall be buried 0.25 to 0.75
2 inches. Seeding shall not be performed when weather conditions are unfavorable: high wind,
3 heavy rain, etc.

4
5 Drilling shall maintain cross-slope furrows on slopes.

6
7 Mulching: Mulch shall be spread uniformly at a rate of 1 ton per acre. Mulch shall be
8 anchored into the soil to a depth of at least 2 in. and with no more than one pass of the
9 equipment. Mulching shall not be performed when wind interferes with mulch placement.

10
11 Protection: Traffic over seeded area shall be prohibited.

12
13 FIELD QUALITY CONTROL:

14
15 Seedbed Inspection: Seeding shall not proceed until the Contractor's Representative has
16 inspected the seedbed for conformance to these specifications.

17
18 Surveillance will be performed by the Contractor's Representative to verify compliance of
19 the work to the drawings and specifications.

20
21 END OF SECTION 02486

Project Title: OU7-10 Glovebox Excavator Method Project
Site Development
Document Type: Construction Specification **Project Number:** 021052
SPC Number: 352, Revision 1

1 SECTION 03300--CAST IN PLACE CONCRETE

2

3 PART 1--GENERAL

4

5 SUMMARY:

6

7 Section Includes, but is not limited to:

8

9 Slabs

10 Concrete supports for firewater pipe

11 Miscellaneous exterior pads not covered in other sections

12 Electrical grounding mat

13

14 REFERENCES:

15

16 The following documents, including others referenced therein, form part of this Section to the
17 extent designated herein:

18

19 AMERICAN CONCRETE INSTITUTE (ACI)

20

21 ACI 117 Standard Specifications for Tolerances for Concrete
22 Construction and Materials

23 ACI 301 Specifications for Structural Concrete for Buildings

24 ACI 305 Hot Weather Concreting

25 ACI 306.1 Standard Specification for Cold Weather Concreting

26 ACI 318 Building Code Requirements for Reinforced Concrete

27 ACI 347 Guide to Formwork for Concrete

28

29 CONCRETE REINFORCING STEEL INSTITUTE, (CRSI)

30

31 CRSI Manual of Standard Practice

32

33 AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

34

35 ASTM C 94 Standard Specification for Ready-Mixed Concrete

36

37 The following ASTM specifications are referenced in regard to materials:

38

39 ASTM A 615 Standard Specification for Deformed and Plain Billet-Steel
40 Bars for Concrete Reinforcement

41 ASTM A 706 Standard Specification for Low-Alloy Steel Deformed and
42 Plain Bars for Concrete Reinforcement

43 ASTM C 33 Standard Specification for Concrete Aggregates

44 ASTM C 150 Standard Specification for Portland Cement

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

**Document Type: Construction Specification
SPC Number: 352, Revision 1**

Project Number: 021052

1	ASTM C 260	Standard Specification for Air-Entraining Admixtures for
2		Concrete
3	ASTM C 309	Standard Specification for Liquid Membrane-Forming
4		Compounds for Curing Concrete
5	ASTM C 494	Standard Specification for Chemical Admixtures for Concrete
6	ASTM C 618	Standard Specification for Coal Fly Ash and Raw or Calcined
7		Natural Pozzolan for Use as a Mineral Admixture in Concrete
8		

9 The following ASTM standards shall be used by the inspecting agency for concrete tests or
10 inspections:

11		
12	ASTM C 31	Standard Practice for Making and Curing Concrete Test
13		Specimens in the Field
14	ASTM C 39	Standard Test Method for Compressive Strength of Cylindrical
15		Concrete Specimens
16	ASTM C 143	Standard Test Method for Slump of Hydraulic Cement
17		Concrete
18	ASTM C 172	Standard Practice for Sampling Freshly Mixed Concrete
19	ASTM C 231	Standard Test Method for Air Content of Freshly Mixed
20		Concrete by the Pressure Method
21		

22 SUBMITTALS:

23
24 Submittals include, but are not limited to the following:

25
26 Mix Design: Submit mix design for each grade of concrete used.

27
28 See Section 01300, Submittals and the Vendor Data Schedule for additional submittal
29 requirements.

30
31 QUALITY CONTROL:

32
33 Comply with provisions of ACI 301 unless otherwise specified herein.

34
35 PART 2--PRODUCTS

36
37 FORM MATERIALS:

38
39 Forms for Exposed Finish Concrete: Provide continuous, straight, smooth, exposed surfaces.
40 Furnish in largest practicable sizes to minimize number of joints. Provide form material with
41 sufficient thickness to withstand pressure of newly-placed concrete without visible bow or
42 deflection.

43
44 Plywood shall comply with American Plywood Association, grade "EXT-DFPA
45 PLYFORM" or better.

Project Title: OU7-10 Glovebox Excavator Method Project
Site Development
Document Type: Construction Specification **Project Number:** 021052
SPC Number: 352, Revision 1

1
2 Forms for Unexposed Finish Concrete: Form concrete surfaces, which will be, unexposed in
3 finished structure with plywood, lumber, or metal.

4
5 Form Coatings: Provide commercial formulation form-coating compounds that will not bond
6 with, stain nor adversely affect concrete surfaces, and will not impair subsequent treatments
7 of concrete surfaces.

8
9 REINFORCING MATERIALS:

10
11 Reinforcing Bars: ASTM A 615 Grade 60 deformed, as indicated on the drawings. Grade 40
12 may be used for No. 4 and smaller ties.

13
14 Tie Wire: ASTM A82.

15
16 Supports for Reinforcement: Provide supports for reinforcement including bolsters, chairs,
17 spacers and other devices for spacing, supporting and fastening reinforcing in place. Use
18 wire bar type supports complying with CRSI recommendations, or approved substitute. Use
19 supports with sand plates or horizontal runners where base material will not support chair
20 legs. Pumice blocks, adobe, bricks, rocks, etc. are not acceptable for rebar or wire mesh
21 supports.

22
23 CONCRETE MATERIALS:

24
25 Portland Cement: Cement shall conform to ASTM C 150, Type I-II. The cement shall
26 contain no more than 0.60% by weight of alkalis calculated as (Na₂O + 0.658 K₂O).

27
28 Aggregate: Fine and coarse aggregate shall conform to ASTM C 33. Maximum coarse
29 aggregate size shall conform to ACI 318 paragraph 3.3.2. Unless otherwise specified,
30 maximum aggregate size shall be 1 1/2 in.

31
32 Mixing Water: Potable having no pronounced taste or odor, and containing no deleterious
33 materials.

34
35 Air-Entraining Agents (AEA): ASTM C 260.

36
37 High Range Water-Reducing Admixture (Superplasticizer): If a superplasticizer is used it
38 shall conform to ASTM C 494, Type F.

39
40 Water-Reducing Admixtures: If water-reducing admixtures are used they shall conform to
41 ASTM C 494, Type A, and contain no more than 1% chloride ions.

42
43 Calcium Chloride: Calcium chloride is not permitted.

44
45 RELATED MATERIALS:

Project Title: OU7-10 Glovebox Excavator Method Project
Site Development
Document Type: Construction Specification **Project Number:** 021052
SPC Number: 352, Revision 1

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Nonshrink Grout: Provide one of the following:

- "Masterflow 713;" MBT Protection and Repair
- "SonogROUT 10K;" Sonneborn Building Products
- "Five Star Grout;" Five Star Products, Inc.

Curing Compound: Curing compound or curing-hardener-sealer compound shall comply with ASTM C 309, Type I, Class A.

The number of coats shall be as recommended by the manufacturer, but in any case, floor slabs to be left exposed shall receive at least a second coat just after final clean-up.

Bonding Compound: Provide one of the following:

- "Everbond" L & M Construction Chemical Corporation
- "Sikabond" Sika Corporation
- "Weld-Crete" Larsen Products Corporation.

Waterstop: Swellstop as manufactured by Greenstreak Plastic Products Company, Inc.

Joint Sealing Compound: Provide a polyurethane joint sealant material.

Expansion Joint Material: Provide 1/2 in. asphalt impregnated fibrous expansion material.

PROPORTIONING AND DESIGN OF MIXES:

Mix Design: Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 318.

Design mixes to provide normal weight concrete with the following specified 28-day compressive strengths, minimum, as indicated on drawings and schedules:

- Class 20: 2000 psi (thrust blocks)
- Class 30: 3000 psi (supports for firewater pipe, fire riser building slab, electrical and grounding mat)

See FIELD QUALITY CONTROL of this specification for acceptance criteria.

Adjustment to concrete mixes may be requested by the Subcontractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant. Revised mix designs must be submitted and approved prior to use.

Concrete in hard-to-place locations may utilize a high-range water reducer. No other water-reducer shall be used with a high-range water-reducer.

Project Title: OU7-10 Glovebox Excavator Method Project
Site Development
Document Type: Construction Specification **Project Number:** 021052
SPC Number: 352, Revision 1

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Durability: Concrete which will be subject to freezing and thawing, weathering, or deicer chemicals shall be air-entrained. The concrete mix shall contain a pozzolan (fly ash). When fly ash is used, the minimum amount shall be 15% by weight of the total cementations materials unless otherwise approved. Add air entraining agent (AEA) at the manufacturer's prescribed rate to result in concrete at point of placement having air content within the following limits:

Maximum aggregate size (in.)	Air content (percent)	
	Severe exposure	Moderate exposure
1/2	5 1/2 to 8 1/2	4 to 7
3/4	4 1/2 to 7 1/2	3 1/2 to 6 1/2
1	4 1/2 to 7 1/2	3 to 6
1 1/2	4 to 7	3 to 6

9
10
11

Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as follows:

Reinforced foundations: 3 ± 1 in.

Slabs and other structural concrete: 3 1/2 ± 1 1/2 in.

12
13
14
15
16

MIXING AND DELIVERY:

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18
19
20
21

The manufacture and delivery of all concrete shall conform to ASTM C 94 except as modified herein. Hand-mixed concrete is prohibited.

22
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When concrete arrives at the job site with slump below that suitable for placing, as indicated by the specification, water may be added only if the maximum permissible water-cement ratio and the maximum permissible slump is not exceeded. Any water thus added to bring the slump within required limits shall be injected in such a manner that uniformity requirements are met. Water shall be incorporated by additional mixing equal to at least half of the total mixing required or 30 drum revolutions at rated mixing speed, whichever is more. Additional AEA may be introduced during this mixing period if necessary to meet specifications. Neither water nor AEA shall be added to the batch at any later time.

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37

Concrete uniformity shall meet the requirements of ASTM C 94 except as modified herein. After final mixing is complete, visible lumps, nonconformance to uniformity requirements, or failure to meet specified slump, entrained air and temperature requirements shall be considered cause for rejecting the remainder of the load. In addition, failure of the ready-mix truck drum to meet uniformity requirements will be deemed cause for rejection of the mixing equipment until adequate repairs have been made.

38
39

Discharge of the concrete shall be completed within 1-1/2 hrs, or before the drum has revolved 300 revolutions, whichever comes first, after the introduction of mixing water to the

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

**Document Type: Construction Specification
SPC Number: 352, Revision 1**

Project Number: 021052

1 cement and aggregates. The Contractor may extend this 1-1/2 hr limit if the concrete still
2 meets all specified requirements after 1-1/2 hrs. (Additional testing to verify conformance to
3 specifications may be necessary.) In hot weather or under conditions contributing to quick
4 stiffening of the concrete a time limit less than 1-1/2 hrs may be designated by the
5 Contractor.

6
7 High-range water-reducing admixtures (superplasticizer) shall be added to the mixer at the
8 job site, and then be allowed to mix for at least 5 min.

9
10 Concrete that is rejected for failure to meet any of the above requirements will be evaluated
11 by the Contractor and may be removed and replaced at the expense of the Subcontractor.

12
13 Hot or Cold Weather Concreting: Methods and means of batching, mixing and delivery of
14 concrete in hot or cold weather shall comply with ACI-301 or ACI-306.1

15
16 SOURCE QUALITY CONTROL:

17
18 The Subcontractor shall provide the necessary testing and monitoring to qualify proposed
19 materials and establish mix designs.

20
21 PART 3--EXECUTION

22
23 FORMS:

24
25 Unless otherwise shown on the drawings, all forms shall be straight and plumb, rigid and
26 mortar tight. All forms shall be braced, tied and supported sufficiently to maintain their
27 required position during and after the placing of concrete. Joints shall be sufficiently tight to
28 prevent mortar leakage. Where shown on the drawings, suitable moldings shall be placed in
29 forms to shape edges or surfaces of concrete members. All formwork shall conform to the
30 guidelines in ACI 347.

31
32 All exposed corners of concrete shall be chamfered 1 in.

33
34 Form Ties: Use factory-fabricated, adjustable-length, removable or snap-off metal form ties,
35 designed to prevent form deflection, and to prevent spalling concrete surface upon removal:

36
37 Unless otherwise indicated, provide ties so those portions remaining within concrete after
38 removal will not be within 1 in. of any exposed concrete surface.

39
40 Form ties for walls subject to hydrostatic pressure shall have water seals.

41
42 Provisions for Other Trades: Provide openings in concrete formwork to accommodate work
43 of other trades.

44

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

**Document Type: Construction Specification
SPC Number: 352, Revision 1**

Project Number: 021052

1 Tolerances: Unless otherwise noted on the drawings, formwork shall be constructed so that
2 the concrete surfaces conform to the tolerance limits listed in ACI 117.

3
4 Preparation of Form Surfaces: Coat contact surfaces of forms with a form-coating compound
5 before reinforcement is placed. Do not allow form-coating compound to come into contact
6 with reinforcement or with concrete surfaces against which fresh concrete will be placed.

7
8 PLACING REINFORCEMENT:

9
10 Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that reduce or
11 destroy bond with concrete.

12
13 Accurately position, support and secure reinforcement against displacement by formwork,
14 construction, or concrete placement operations.

15
16 Place reinforcement to obtain at least minimum coverages for concrete protection. Unless
17 otherwise indicated, reinforcement position shall be as necessary to meet coverage, spacing
18 and placement requirements specified in ACI 318, Chapter 7.

19
20 Unless otherwise shown on the drawings, splicing of reinforcement shall be in accordance
21 with ACI 318, Chapters 7 and 12. Unless otherwise indicated on the drawings, all splices
22 shall be Class B tension splices for regular bars.

23
24 JOINTS:

25
26 Construction Joints: Locate and install construction joints, when not shown on drawings, so
27 as not to impair strength and appearance of the structure, and as acceptable to the
28 Contractor's Representative.

29
30 Isolation (Expansion) Joints in Slabs-on-Ground: Construct isolation joints in slabs-on-
31 ground at points of contact between slabs on ground and vertical surfaces, such as slabs.
32 Provide expansion joint material in all isolation joints. Material shall be placed 1/4 in. below
33 slab elevation and extend the full depth of the slab.

34
35 Asphalt and Slabs-On-Ground Interface: Sawcut existing asphalt where concrete and asphalt
36 are to meet in order to provide a straight, clean joint.

37 INSTALLATION OF EMBEDDED ITEMS:

38
39 Set and build into work anchorage devices and other embedded items required for other work
40 that is attached to, or supported by cast-in-place concrete. Secure all such items firmly in
41 position.

42
43 CONCRETE PLACEMENT:

44

Project Title: OU7-10 Glovebox Excavator Method Project

Site Development

Document Type: Construction Specification

Project Number: 021052

SPC Number: 352, Revision 1

1 Preplacement Inspection: Completed formwork, reinforcing steel, and items to be embedded
2 shall be inspected and approved prior to placement. However, such approval shall in no way
3 release the Subcontractor from responsibility for acceptable and satisfactorily completed
4 work. For concrete cast against soil, the soil shall be free from frost or ice and shall be
5 wetted down before placement.
6

7 Placing Concrete in Forms: The concrete shall be deposited continuously in horizontal layers
8 with each succeeding layer placed before the preceding layer has reached its initial set.
9

10 Consolidation: During and immediately after placing, all concrete shall be consolidated
11 sufficiently to provide thorough placement around all reinforcement, embedded items, and
12 into corners of forms without segregating the mix. Vibration shall penetrate the placed layer
13 and at least 6-in. into the preceding layer. Do not use vibrators to move concrete inside the
14 forms. A spare vibrator shall be on hand at the job site and available to substitute for any
15 other vibrator which fails during placement.
16

17 Dropping of Concrete: Maximum allowable free vertical drop shall be 5 ft. For drops
18 greater than 5 ft, a confining device shall be used, subject to the approval of the Contractor.
19

20 Cold Weather Placing: Protect concrete work from damage or reduced strength which could
21 be caused by frost, freezing, or low temperatures, in compliance with ACI 306.1 and as
22 specified herein. Minimum concrete temperature as placed and maintained shall be 55° F, or
23 as required by ACI-306.1, Table 3.2.1.
24

25 Hot Weather Placing: When hot weather conditions that would seriously impair quality and
26 strength of concrete exist, place concrete in compliance with ACI 305 and as specified
27 herein:
28

29 Cool mixing drum and/or ingredients before mixing to maintain concrete temperature below
30 95° F at time of placement.
31

32 FINISH OF FORMED SURFACES: 33

34 Rough Form Finish (RfFm): Provide as-cast rough form finish to formed concrete surfaces
35 that are to be concealed in finish work or by other construction, unless otherwise indicated.
36

37 Standard rough form finish shall be the concrete surface having the texture imparted by the
38 form facing material used, with tie holes and defective areas repaired and patched and all fins
39 and other projections exceeding 1/4 in. in height rubbed down or chipped off.
40

41 Smooth Form Finish (SmFm): Provide as-cast smooth form finish for formed concrete
42 surfaces that are exposed-to-view, or that are covered with a coating material applied directly
43 to concrete, or a covering material bonded to concrete such as waterproofing, dampproofing,
44 painting, or other similar system.
45

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

**Document Type: Construction Specification
SPC Number: 352, Revision 1**

Project Number: 021052

1 Produce smooth form finish (SmFm) by selecting form material to impart a smooth, hard,
2 uniform texture and arranging them orderly and symmetrically with a minimum of seams.
3 Repair and patch defective areas with fins or other projections completely removed and
4 smoothed.

5
6 Related Unformed Surfaces: At tops of wall, horizontal offsets, and similar unformed
7 surfaces occurring adjacent to formed surfaces, strike off smooth and finish with texture
8 matching adjacent formed surfaces.

9
10 SLAB FINISHES:

11
12 Float Finish (Flt): Apply float finish to monolithic slab surfaces to receive trowel finish and
13 other finishes as hereinafter specified, and slab surfaces which are to be covered with
14 membrane or elastic waterproofing, membrane or elastic roofing, and as otherwise shown on
15 drawings or in schedules.

16
17 After screeding, consolidating, and leveling concrete slabs, do not work surface until ready
18 for floating. Begin floating when surface water has disappeared or when concrete has
19 stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface
20 by hand floating. Check and level surface plane to a tolerance not exceeding 1/4 in. in 10 ft
21 when tested with a 10-ft straightedge placed on surface at not less than two different angles.
22 Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately
23 after leveling, refloat surface to uniform, smooth, granular texture.

24
25 Trowel Finish (Trw): Apply trowel finish to monolithic slab surfaces to be exposed to view,
26 unless otherwise indicated, and slab surfaces to be covered with paint, or other thin-film
27 finish coating system.

28
29 After floating, begin first trowel finish operation. Begin final troweling when surface
30 produces ringing sound as trowel is moved over surface.

31
32 Consolidate concrete surface by final hand troweling operation, free of trowel marks,
33 uniform in texture and appearance, and with surface plane tolerance not exceeding 1/8 in. in
34 10 ft when tested with a 10-ft straightedge.

35
36 CONCRETE CURING AND PROTECTION:

37
38 General: Protect freshly placed concrete from injurious action by sun, rain, wind, flowing
39 water, mechanical injury and premature drying for not less than seven (7) consecutive days
40 after placement.

41
42 Protect concrete against damage from frost or freezing for a minimum of 3 days. Provisions
43 of ACI 306.1 shall apply for cold weather unless otherwise specified.

44

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

**Document Type: Construction Specification
SPC Number: 352, Revision 1**

Project Number: 021052

1 Alternatively, if tests are made of cylinders kept near the structure and cured by the same
2 methods, moisture retention measures may end when the average compression strength has
3 reached 70% of the specified strength. Other alternatives such as those given in ACI 301,
4 5.3.6 may also be used if approved by the Contractor.
5

6 Early Loading of New Concrete: Early loading of concrete structures shall comply with
7 requirements of ACI 318, Section 6.2. When construction loading is proposed before
8 concrete has achieved its 28-day design strength, structural calculations and concrete strength
9 test data shall be submitted and approved prior to loading.
10

11 Curing Methods: Perform curing of concrete by one or more of the following methods:
12

13 Moist Curing: Cover concrete surfaces with moisture retaining cover for curing period.
14 Wood forms shall be kept sufficiently wet at all times to prevent the forms from separating at
15 the joints and the concrete from drying.
16

17 Membrane Curing: Concrete surfaces to receive membrane curing shall be treated with a
18 curing compound as specified or otherwise approved. The curing compound shall be applied
19 in strict accordance with the directions of the manufacturer of the compound.
20

21 Temperature, Wind, and Humidity:
22

23 Cold Weather: When the mean daily outdoor temperature is less than 40° F, the
24 temperature of the concrete surface shall be maintained between 55 and 90° F for the
25 required curing period. When necessary, arrangements for heating, covering,
26 insulating, or housing the concrete work shall be made in advance of placement and
27 shall be adequate to maintain the required temperature without injury due to
28 concentration of heat. Combustion heaters shall not be used during the first 24 hrs
29 unless precautions are taken to prevent exposure of the concrete to exhaust gases that
30 contain carbon dioxide. If early loading is anticipated during cold weather, provide
31 temperature protection to insure necessary strength development.
32

33 The concrete surface temperature requirements (based on section thickness) in ACI
34 306.1 may be used in lieu of the 55° F minimum specified before.
35

36 If concrete surface temperatures as measured by the inspecting agency are below the
37 minimum curing temperature but meet the freeze protection requirements, the
38 concrete curing period shall be extended to ensure adequate strength is developed.
39 The extension time shall be at least equivalent to the time period in which
40 temperatures were too low.
41

42 Hot Weather: The concrete surfaces shall be kept below 100° F for the curing period.
43 When necessary, provision for windbreaks, shading, fog spraying, sprinkling,
44 ponding, or wet covering with a light colored material shall be made in advance of

Project Title: OU7-10 Glovebox Excavator Method Project
Site Development
Document Type: Construction Specification **Project Number:** 021052
SPC Number: 352, Revision 1

1 placement, and such protective measures shall be taken as quickly as concrete
2 hardening and finishing operations will allow.

3
4 Rate of Temperature Change: Changes in temperature of the air immediately
5 adjacent to the concrete during and immediately following the curing period shall be
6 kept as uniform as possible and shall not exceed 5° F in any 1-hr or 50° F in any 24-hr
7 period.

8
9 REMOVAL OF FORMS:

10
11 Formwork Not Supporting Weight of Concrete: This formwork may be removed after
12 cumulatively curing at not less than 50° F for 32 hrs after placing concrete, provided concrete
13 is sufficiently hard not to be damaged by form removal or subsequent operations. Curing
14 must then continue through the minimum curing period.

15
16 Formwork Supporting Weight of Concrete: This formwork may not be removed until
17 concrete has attained its 28-day design compressive strength, except as permitted under
18 "Early Loading of New Concrete".

19
20 CONCRETE SURFACE REPAIRS:

21
22 All porous and fractured concrete shall be repaired. Surface defects may be repaired by
23 patching. Surface defects include color and texture irregularities, cracks, spalls, air bubbles,
24 honeycomb, rock pockets, fins, snap-tie holes and other projections on the surface. The
25 Contractor shall approve all repairs. Alternate repair methods not specified may be used if
26 approved by the Contractor.

27
28 Patch Defective Areas: Repair and patch defective areas with cement mortar immediately
29 after removal of forms, when approved by the Contractor. Cut out honeycomb, rock pockets,
30 and voids over 2 in. in any dimension. Thoroughly clean, dampen with water and brush-coat
31 the area to be patched with specified bonding agent. Place patching mortar after bonding
32 agent has dried.

33
34 Defects exceeding 2 in. in diameter shall be repaired by removing defective areas, cleaning,
35 treating with bonding agent, and replacing with new concrete.

36

Project Title: OU7-10 Glovebox Excavator Method Project
Site Development
Document Type: Construction Specification **Project Number:** 021052
SPC Number: 352, Revision 1

1 FIELD QUALITY CONTROL:
2

3 Subcontractor Supplied Testing: The Subcontractor shall provide the necessary testing and
4 monitoring services for the following:
5

6 Other testing services needed by the Subcontractor to control or monitor the production,
7 transportation, placement, protection, curing or temperature of the concrete.
8

9 The use of Contractor supplied inspection or testing services shall in no way relieve the
10 Subcontractor of the responsibility to furnish materials and construction in full compliance
11 with the subcontract documents.
12

13 Contractor Supplied Testing: The Contractor's Representative will perform tests during
14 placement and curing of the concrete. Monitoring of concrete protection and curing methods
15 will also occur.
16

17 Sampling and testing for quality control during placement of concrete will include the
18 following:
19

20 Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with
21 ASTM C 94.
22

23 Slump: ASTM C 143.
24

25 Air Content: ASTM C 231.
26

27 Concrete Temperature: Test when air temperature is 40 F or below, or when 90° F or
28 above, and at any other times as selected by the Contractor.
29

30 Concrete Uniformity Test for Adequacy of Mixing Equipment: ASTM C 94.
31

32 Compression Test Specimen: ASTM C 31; one set of 4 standard cylinders for each
33 compressive strength test, unless otherwise directed.
34

35 Subsequent tests may include:
36

37 Compressive Strength Tests: ASTM C 39; frequency of testing shall comply with
38 ACI 318, Chapter 5, Section 5.6, unless otherwise directed.
39
40

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

**Document Type: Construction Specification
SPC Number: 352, Revision 1**

Project Number: 021052

1 Strength level of an individual class of concrete shall be considered satisfactory if
2 both of the following requirements are met:

3
4 Average of all sets of three (or less if three are not available) consecutive strength
5 tests equal or exceed the specified 28-day compressive strength.
6

7 No individual strength test (average of two cylinders) falls below the specified 28-day
8 compressive strength by more than 500 psi.
9

10 Inspection or test results not conforming to the stated requirements of this
11 specification shall be reported to the Contractor's Representative for evaluation and
12 disposition with the concurrence of the Engineer.
13

14 Nondestructive Tests: Testing by impact hammer, sonoscope, or other nondestructive
15 device may be performed to determine relative strengths at various locations in the
16 structure as an aid in evaluating concrete strength in place or for selecting areas to be
17 cored. Such tests, unless properly calibrated and correlated with other test data, shall
18 not be used as a basis for acceptance or rejection of the concrete.
19

20 Surveillance will be performed by the Contractor's Representative to verify compliance of
21 the work to the drawings and specifications.
22

23 END OF SECTION 03300
24

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

**Document Type: Construction Specification
SPC Number: 352, Revision 1**

Project Number: 021052

1 SECTION 03400--PRECAST CONCRETE

2
3 PART 1--GENERAL

4
5 SUMMARY:

6
7 The Subcontractor shall provide all plant, labor, and materials required to construct and
8 install precast concrete complete with accessories, reinforcing, grout, as required by the
9 drawings and these specifications.

10
11 Section Includes: Work includes, but is not limited to:

12
13 Furnish and install precast concrete as shown on the drawings for firewater pipe
14 support.

15
16 Related Sections: Section 03300, Cast In Place Concrete

17
18 REFERENCES:

19
20 The following documents, including others referenced therein, form part of this Section to
21 the extent designated herein.

22
23 AMERICAN CONCRETE INSTITUTE (ACI)

24
25 ACI 301 Specifications for Structural Concrete for Buildings
26 ACI 318 Building Code Requirements for Reinforced Concrete

27
28 AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

29
30 ASTM C990 Standard Specification for Joints for Concrete Pipe, Manholes, and
31 Precast Box Sections Using Preformed Flexible Joint Sealants
32 ASTM A36 Standard Specification for Carbon Structural Steel
33 ASTM A615 Standard Specification for Deformed and Plain Billet-Steel Bars for
34 Concrete Reinforcement (AASHTO No. M31)

35
36 AMERICAN WELDING SOCIETY (AWS)

37
38 AWS D1.1 Standard Qualification Procedure
39
40

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

**Document Type: Construction Specification
SPC Number: 352, Revision 1**

Project Number: 021052

1 SUBMITTALS:

2
3 Submittals include, but are not limited to the following:

4
5 Shop Drawings: Submit drawings indicating fabrication and erection requirements. Show
6 details of joints, reinforcements, inserts, and lifting devices.

7
8 See Section 01300, Submittals and the Vendor Data Schedule for additional submittal
9 requirements.

10
11 QUALITY CONTROL:

12
13 Qualifications of Workmen: Precast shall be regularly engaged in the manufacture and
14 erection of precast concrete products, having a recognized background in such work.

15
16 Qualify welding processes and welding operators in accordance with AWS D1.1 "Standard
17 Qualification Procedure".

18
19 Codes and Standards: Comply with provisions of ACI 301 unless otherwise specified herein.

20
21 Testing: Perform design mix test and field tests in accordance with Section 03300, Cast In
22 Place Concrete, except that not less than 2 production sets of strength tests will be taken from
23 separate pours.

24
25 Inspection: Factory inspection of precast concrete structures shall be arranged for by the
26 Contractor at no cost to the Subcontractor. However, this shall not relieve the Subcontractor
27 from responsibility for compliance with specifications and accuracy of the work in all details.
28 The Subcontractor shall notify the Contractor 3 workdays prior to casting concrete.

29
30 STORAGE AND HANDLING:

31
32 Follow recommendations of ACI 318 for precast concrete.

33
34 Lift only at designated lifting and support points by approved devices.

35
36 Protect edges from spalling, chipping, or cracking with suitable padding or wrapping.

37
38 PART 2--PRODUCTS

39
40 FORM MATERIALS:

41
42 Forms for Exposed Finish Concrete: Unless otherwise indicated, construct formwork for
43 exposed concrete surfaces with plywood, metal, or metal-framed plywood faced to provide
44 continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

**Document Type: Construction Specification
SPC Number: 352, Revision 1**

Project Number: 021052

1 minimize number of joints. Provide form material with sufficient thickness to withstand
2 pressure of newly-placed concrete without visible bow or deflection.

3
4 Plywood shall comply with American Plywood Association, grade "EXT-DFPA Plyform" or
5 better.

6
7 Forms for Unexposed Finish Concrete: Form concrete surfaces which will be unexposed in
8 finished structure with plywood, lumber, or metal.

9
10 Form Coatings: Provide commercial formulation form-coating compounds that will not bond
11 with, stain nor adversely affect concrete surfaces, and will not impair subsequent treatments
12 of concrete surfaces.

13
14 REINFORCING MATERIALS:

15
16 Reinforcing Bars: ASTM A615 Grade 60 deformed; Grade 40 may be used for No. 4 and
17 smaller ties.

18
19 Supports for Reinforcement: Provide supports for reinforcement including bolsters, chairs,
20 spacers and other devices for spacing, supporting and fastening reinforcing in place. Use
21 wire bar type supports complying with CRSI recommendations, unless otherwise indicated.
22 Use supports with sand plates or horizontal runners where base material will not support
23 chair legs. Pumice blocks are not acceptable for rebar or wire mesh supports.

24
25 Plates: Embedded plates shall be ASTM A36.

26
27 Prestressing: Comply with ASTM A416 and/or ASTM A421.

28
29 Concrete Mix: Comply with applicable requirements of Section 03300 for following
30 concrete class:

31
32 Cement: Type II
33 Class 30: 3,000 psi 28-day compressive strength
34 Slump: 3 in. ± 1 in.

35
36 Metal Accessories:

37
38 Joint Sealants: Comply with ASTM C990, Preformed Flexible Joint Sealants.

39
40 DESIGN CRITERIA:

41
42 General: All precast concrete shall be designed in accordance with ACI 318.

43 Loads: All precast items shall be capable of withstanding all lifting and handling loads.

44

Project Title: OU7-10 Glovebox Excavator Method Project

Site Development

Document Type: Construction Specification

Project Number: 021052

SPC Number: 352, Revision 1

1 FABRICATION:

2

3 General: Maintain formwork to provide complete precast concrete of the shape, lines, and
4 dimensions indicated. Provide and install chamfer strips on exterior edges.

5

6 Casting Tolerances:

7

8 Length \pm 1/2 in.

9 Width \pm 1/4 in.

10 Depth \pm 1/4 in.

11 Position of handling devices \pm 2 in.

12 Position of embedded angles to be welded between adjoining panels \pm 1 in.
13 longitudinally.

14 Deflection 1/8 in per 10 ft, but not greater than 1/2 in. between adjoining panels.

15 Squareness of Ends (vertical and horizontal alignment) \pm 1/4 in.

16

17 Finishing: Fabricate with a smooth form finish. See Section 03300.

18

19 Curing: Comply with applicable requirements of Section 03300.

20

21 Lifting: Do not lift precast units until concrete has obtained a minimum of 3,000 psi
22 compressive strength (fc') as determined by test cylinders cast on the same day. If design
23 requires a higher compressive strength before lifting the higher strength shall apply.

24

25 PART 3--EXECUTION

26

27 INSPECTION:

28

29 Before installing, verify conditions are adequate to receive precast units. Required
30 corrections to be made before proceeding with placement.

31

32 Determine field conditions by actual measurements. Double check and cross check
33 measurements.

34

35 All precast structures shall be inspected prior to placement for damage or casting deviations
36 in excess of tolerances specified.

37

38 ERECTION:

39

40 Employ only competent personnel who are properly trained to prepare, handle, and install
41 precast concrete.

42 Method of installation shall avoid soiling, cracking, chipping of concrete, and damage to
43 built-in items.

44

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

**Document Type: Construction Specification
SPC Number: 352, Revision 1**

Project Number: 021052

1 Apply joint sealant material at joints of sections.

2

3 FIELD QUALITY CONTROL

4

5 Surveillance will be performed by Contractor's Representative to verify compliance of the
6 work to the drawings and specifications.

7

8 END OF SECTION 03400

Project Title: OU7-10 Glovebox Excavator Method Project

Site Development

Document Type: Construction Specification

Project Number: 021052

SPC Number: 352, Revision 1

1 SECTION 05100--STRUCTURAL STEEL AND MISCELLANEOUS METALS

2

3 PART 1--GENERAL

4

5 SUMMARY:

6

7 The Subcontractor shall supply all labor, equipment, and materials required to construct
8 items listed hereafter and as shown on the drawings.

9

10 Work includes, but is not limited to:

11

12 Structural steel shapes

13 Miscellaneous steel such as guard posts, anchors, and embedments.

14

15 REFERENCES:

16

17 The following documents including others referenced therein, form part of this Section to the
18 extent designated herein.

19

20 AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

21

22 AISC Code of Standard Practice for Steel Buildings and Bridges

23 AISC (ASD) Specification for Structural Steel Buildings - Allowable Stress

24 Design (ASD) and Plastic Design

25

26 AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

27

28 ANSI Z49.1 Safety in Welding

29

30 AMERICAN WELDING SOCIETY (AWS)

31

32 AWS A2.4 Symbols for Welding, Brazing, and Nondestructive

33 Examination

34 AWS B2.1 Specification for Welding Procedure and Performance

35 Qualification

36 AWS D1.1 Structural Welding Code - Steel

37 AWS D1.3 Structural Welding Code - Sheet Steel

38

39 STEEL STRUCTURES PAINTING COUNCIL (SSPC)

40

41 SSPC SP-7 Brush-off Blast Cleaning

42 SSPC Paint 25 Red Iron Oxide, Zinc Oxide, Raw Linseed Oil and Alkyd

43 Primer (without Lead and Chromate Pigments)

44

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

**Document Type: Construction Specification
SPC Number: 352, Revision 1**

Project Number: 021052

1 The following specifications are referenced in regard to materials:

2
3 **AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)**

4
5

6	ASTM A 36	Structural Steel
7	ASTM A 53	Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
8	ASTM A 307	Carbon Steel Bolts and Studs, 60000 psi Tensile Strength
9	ASTM A 325	High-Strength Bolts for Structural Steel Joints
10	ASTM A 490	Heat-Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength
11		
12	ASTM A 500	Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
13		
14	ASTM A 572	High-strength, Low-alloy Columbium-Vanadium Steels of Structural Quality
15		
16	ASTM A 611	Steel, Sheet, Carbon, Cold-Rolled, Structural Quality
17	ASTM A 653	Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality
18		
19	ASTM A 924	Sheet Steel, Zinc Coated (Galvanized) by the Hot Dip Process
20	ASTM A 992	Steel for Structural Shapes for Use in Building Framing

21

22 **SUBMITTALS:**

23
24 Submittals include, but are not limited to the following:

25
26 **Shop Drawings:** Submit shop drawings including all shop and erection details, and members
27 (with their connections) not shown on the Subcontractor drawings. All welds shall be
28 indicated by standard welding symbols of AWS A2.4.

29
30 **Welders:** Submit certified copies of welders qualification test records.

31
32 **Certificates:** Shop Certified Welder Inspection Certificate.

33
34 See Section 01300, Submittals and the Vendor Data Schedule for additional submittal
35 requirements.

36
37 **QUALITY CONTROL:**

38
39 **Qualification for Welding Work:**

40
41 **Off-Site:** Qualify welding processes and operators for shop welding in accordance
42 with AWS D1.1. Short arc gas process (GMAW-S) not allowed

43
44 **On-Site:** Qualify welding operators for on-site (field) welding in accordance with the
45 INEEL Welding Manual. On-site welding will be performed to WPS C3.5 as

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

**Document Type: Construction Specification
SPC Number: 352, Revision 1**

Project Number: 021052

1 applicable. Short arc gas process (GMAW-S) not allowed. All welders shall be
2 qualified at the INEEL Welder Test Facility.

3

4 DELIVERY, STORAGE AND HANDLING:

5

6 Store material to permit easy access for inspection and identification. Protect members and
7 materials from corrosion and deterioration.

8

9 Do not store materials in a manner that might cause distortion or damage to members or
10 supporting structures. Repair or replace damaged materials that do not meet these
11 specifications.

12

13 PART 2--PRODUCTS

14

15 MATERIALS:

16

17 Structural Steel W Shapes: ASTM A 992, except where other type steel is indicated.

18

19 Structural Steel C, S, M, and HP Shapes: ASTM A 36, except where other type steel is
20 indicated.

21

22 Miscellaneous Steel Plates, Angles and Bars: ASTM A 36, except where other type steel is
23 indicated.

24

25 Cold-Formed Steel Tubing: ASTM A 500, Grade B.

26

27 Steel Pipe: ASTM A 53, Type E or S, Grade B or ASTM A 120, Grade B.

28

29 Shop Painting: Remove loose scale, heavy rust, and other foreign materials from fabricated
30 joists and accessories before application of shop paint.

31

32 Apply one shop coat of steel prime paint by spraying, dipping, or other method to provide a
33 continuous dry paint film thickness of not less than 0.50 mil.

34

35 Anchor Bolts: ASTM A 307.

36

37 Unfinished Threaded Fasteners: ASTM A 307, Grade A, regular hexagon type, low carbon
38 steel.

39

40

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

**Document Type: Construction Specification
SPC Number: 352, Revision 1**

Project Number: 021052

1 Concrete Anchors: Concrete anchors shall be wedge anchors as manufactured by one of the
2 following manufacturers:

3
4 "Red Head" by ITT Phillips Drill Company
5 "Hilti Kwik-Bolt II" by Hilti Inc.

6
7 Electrodes: Comply with AWS D1.1 for shop welding. Comply with INEEL Weld
8 Procedures indicated for field welding.

9
10 Structural Steel Primer Paint: Primer shall conform to Painting Section 09900.

11
12 FABRICATION:

13
14 Shop Fabrication and Assembly: Fabricate items of structural steel in accordance with AISC
15 ASD Specification.

16
17 Connections: Weld or bolt shop connections, as indicated. Bolt field connections, except
18 where welded connections are indicated.

19
20 Weld Construction: Comply with AWS D1.1 for procedures, appearance and quality of
21 welds, and methods used in correcting welding work.

22
23 Shop Painting:

24
25 General: Shop paint structural steel, except those members or portions of members to
26 be embedded in concrete or mortar. Apply two (2) coats of paint to surfaces which
27 are inaccessible after assembly or erection. See 09900--Painting for finish painting
28 materials and requirements.

29
30 Surface Preparation: After inspection and before shipping, clean steel work to be
31 painted. Remove loose rust, loose mill scale, and splatter, slag or flux deposits.
32 Clean steel in accordance with SSPC SP-7 "Brush-off Blast Cleaning".

33
34 Painting: Immediately after surface preparation, apply structural steel primer paint in
35 accordance with manufacturer's instructions.

36
37 PART 3--EXECUTION

38
39 ERECTION:

40
41 Surveys: Check elevations of concrete and masonry bearing surfaces, and locations of
42 anchor bolts and similar devices, before erection work proceeds, and report discrepancies to
43 the Contractor. Do not proceed with erection until corrections have been made or until
44 compensating adjustments have been agreed upon with the Contractor.

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

Document Type: Construction Specification

Project Number: 021052

SPC Number: 352, Revision 1

1 Temporary Shoring and Bracing: Provide temporary shoring and bracing members with
2 connections of sufficient strength to bear imposed loads.

3
4 Anchor Bolts: Furnish anchor bolts and other connectors required for securing steel to
5 foundations and other in-place work. Furnish templates and other devices as necessary for
6 presetting bolts and anchors to accurate locations.

7
8 Tighten anchor bolts after supported members have been positioned and plumbed. Do not
9 remove wedges or shims, but if protruding, cut off flush with edge of base prior to packing
10 with grout.

11
12 Field Assembly: Set structural steel accurately to lines and elevations indicated. Align and
13 adjust various members before permanently fastening. Clean surfaces which will be in
14 contact before assembly. Perform necessary adjustments to compensate for discrepancies in
15 elevations and alignment. Level and plumb individual members of structure within specified
16 AISC Code of Standard Practice tolerances.

17
18 Splice members only where indicated and accepted on shop drawings.

19
20 Comply with AISC, ASD Specification and Code of Standard Practice for bearing, adequacy
21 of temporary connections, alignment, and removal of paint on surfaces adjacent to field
22 welds.

23
24 Field Connections: Do not use gas cutting in field for correcting fabrication errors in
25 structural framing:

26
27 Field Welding: Field welding shall be done in accordance with the AWS D1.1, the
28 INEEL Welding Manual and INEEL Welding Procedure Specification C3.5.

29
30 FIELD QUALITY CONTROL:

31
32 Contractor Supplied Testing: The Contractor's Representative will inspect welded
33 connections and perform tests and prepare test reports unless noted otherwise. The
34 Contractor's Representative will perform visual inspection of all field welds in accordance
35 with the requirements of Section 6 of AWS D1.1 as applicable. He may also perform a
36 visual receipt inspection of shop welds.

37
38 Contractor Inspection: Surveillance will be performed by the Contractor's Representative to
39 verify compliance of the work to the drawing and specifications.

40
41 Subcontractor Supplied Testing:

42
43 Shop Welding: Certify welders, inspect and test during fabrication of structural steel
44 per AWS D1.1 or AWS B2.1 and AISC ASD Specification. As a minimum visually

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

Document Type: Construction Specification

Project Number: 021052

SPC Number: 352, Revision 1

1 inspect all welds per Section 6 of AWS D1.1 as applicable. The shop certified welder
2 certificate shall be submitted for approval.

3

4 END OF SECTION 05100

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

**Document Type: Construction Specification
SPC Number: 352, Revision 1**

Project Number: 021052

1 SECTION 09900--PAINTING

2

3 PART 1--GENERAL

4

5 SUMMARY:

6

7 Work includes, but is not limited to:

8

9 Painting piping and electrical identification as required.

10 Painting exterior exposed steel (fire water pipe supports etc.).

11 Paint exterior of Fire Riser Building where siding is exterior grade wood siding.

12 Paint insulated steel door and Hollow Metal frame on Fire Riser Building.

13

14 Pre-finished Items: Unless otherwise indicated, do not include field painting when
15 factory-finishing is specified.

16

17 Metal surfaces of anodized aluminum, chromium plate, copper, bronze, stainless steel and
18 similar finished materials will not require finish painting, unless otherwise indicated.

19

20 Metal Fire Rating Labels: Do not paint over any code-required labels, such as Underwriters'
21 Laboratories and Factory Mutual, or any equipment identification, performance rating, name,
22 or nomenclature plates.

23

24 SUBMITTALS:

25

26 Submittals include, but are not limited to the following:

27

28 Product Data: Submit manufacturers technical information, including paint label analysis
29 and application instructions for each material proposed for use.

30

31 Surface Preparation: Submit manufacturer surface preparation instructions.

32

33 Material Safety Data Sheets (MSDS): Submit MSDSs on all products used.

34

35 Samples: Submit manufacturers standard color chips for selection by the Contractor.

36

37 See Section 01300, Submittals and the Vendor Data Schedule for additional submittal
38 requirements.

39

40

Project Title: OU7-10 Glovebox Excavator Method Project
Site Development
Document Type: Construction Specification **Project Number: 021052**
SPC Number: 352, Revision 1

1 QUALITY CONTROL:

2
3 Applicator Qualifications: Engage an experienced applicator who is regularly engaged in the
4 application and installation of, and has successfully completed, coating system applications
5 similar in material and extent to those in this project.

6
7 Single Source Responsibility: Provide primers and undercoat material produced by the same
8 manufacturer as the finish coats and as recommended for the particular substrate and finish
9 coat.

10
11 Application: Strictly follow manufacturer's application instructions.

12
13 DELIVERY, STORAGE, AND HANDLING:

14
15 General: Deliver materials to the job site in the manufacturers original, new, unopened
16 packages and containers bearing the manufacturers name and label, and the following
17 information:

- 18
19 Name or title of material
20 Product description (generic classification or binder type)
21 Manufacturers name, stock number and date of manufacture
22 Contents by volume, for major pigment and vehicle constituents
23 Thinning instructions
24 Application instructions
25 Color name and number
26 Handling instructions and precautions.

27
28 Storage: Store materials not used in tightly covered containers in a well-ventilated area at a
29 minimum ambient temperature of 45⁰ F (7⁰ C). Maintain containers used in storage in a
30 clean condition, free of foreign materials and residue. Volatile liquids and used wiping and
31 cleaning rags shall be kept in tightly closed metal containers. After each days work, empty
32 paint cans and other waste shall be removed from the premises and disposed of as directed by
33 the Contractor. Only one days supply of paint may be brought into the work area. Any extra
34 must be removed from the work area at the end of each day unless otherwise approved by the
35 Contractor. The Subcontractor shall store and handle all paint in a well-ventilated area or
36 room.

37
38

Project Title: OU7-10 Glovebox Excavator Method Project
Site Development
Document Type: Construction Specification **Project Number: 021052**
SPC Number: 352, Revision 1

1 PART 2--PRODUCTS

2

3 MANUFACTURERS:

4

5 Subject to compliance with requirements, provide products of one of the following:

6

- 7 Benjamin-Moore
- 8 Columbia Paint Company
- 9 Devoe and Raynolds Company (ICI)
- 10 Fuller-O'Brien (ICI)
- 11 The Glidden Company (ICI)
- 12 ICI Dulux (ICI)
- 13 Ponderosa Paint Company
- 14 Pratt and Lambert
- 15 Sherwin-Williams Company
- 16 Sika Corporation.

17

18 Unique or special paint requirements are addressed in the following sections.

19

20 MATERIALS:

21

22 Paint shall be well ground, shall not settle excessively, cake or thicken in the container; shall
23 be readily broken up with paddle to a smooth consistency and shall show easy brushing
24 properties. Products containing lead or known carcinogens shall not be used. All products
25 used shall comply with VOC requirements.

26

27 Solids by volume for latex-based coatings shall be not less than 30%. Solids by volume for
28 alkyd based coatings shall not be less than 40%. Solids by volume for wood stains and
29 transparent finishes shall be not less than 20%.

30

31 PAINT SCHEDULE (EXTERIOR):

32

33 Wood:

34

- 35 Semi-Gloss, Acrylic-Enamel Finish:
- 36 Primer: Exterior, acrylic-latex, primer.
- 37 First and Second Coats: Semigloss, waterborne, exterior, acrylic-enamel.

38

39 Ferrous Metal:

40

- 41 Semi-Gloss, Acrylic-Enamel Finish:
- 42 Primer: Rust inhibitive metal primer.
- 43 First and Second Coats: Semigloss, exterior, acrylic-latex enamel.

44

Project Title: OU7-10 Glovebox Excavator Method Project

Site Development

Document Type: Construction Specification

Project Number: 021052

SPC Number: 352, Revision 1

1 Colors: Colors, except as specified hereinafter for Piping Identification and Safety Painting,
2 shall be as selected by the Contractor from current color charts or chips submitted by the
3 Subcontractor. The color charts or chips shall be made by the manufacturer of the paint or
4 labels to be used on the work covered herein. If the same colors required are not available in
5 ready mixed paint, the Subcontractor shall prepare special mixes and submit samples of such
6 mixes to the Contractor for approval.

7
8 Identification Labels: Identification labels for piping identification shall be Brady
9 "Quik-Labels" as manufactured by the W. H. Brady Company. (Stenciling is acceptable.)

10
11 PART 3--EXECUTION

12
13 APPLICATION AND WORKMANSHIP OF PAINTING:

14
15 General: No paint shall be thinned or otherwise altered in any manner other than
16 recommended by the paint manufacturer. All paint shall be applied in strict accordance with
17 the manufacturers instructions, unless specified otherwise herein.

18
19 Number of Coats:

20
21 New Work: One coat of primer and two coats of finish paint except as noted
22 otherwise on the drawings or in these specifications.

23
24 Paint Film Thickness: Dry film thickness of paint films above substrate or existing paint
25 surface shall be as recommended by the paint manufacturer for each coat. However, the
26 accumulated dry film thickness above substrate or existing paint surface shall not be less than
27 2.5 mils. Dry film thickness on non-magnetic surfaces shall be determined by a wet film
28 gauge. Dry film thickness is the wet film thickness multiplied by the percent of solids by
29 volume of the paint.

30
31 Surface Preparation: All surfaces to be painted shall be clean, smooth, dry and free of
32 corrosion. The Subcontractor shall follow the paint manufacturer's recommendations for
33 surface preparation strictly for the particular substrate being painted and shall submit copies
34 of the surface preparation instructions as called for on the Vendor Data Schedule. All
35 hardware, fixtures, fixture plate and similar factory finished items shall be removed or
36 covered in an approved manner before painting is begun. All items shall be replaced and
37 uncovered when the painting work is complete. Concrete surfaces shall be free of mortar
38 splatters, caulking or other foreign matter. Welds that are not prime coated shall be cleaned
39 by wire brushing.

40
41 Damaged Prime Coat or Factory Finish: Damaged shop prime or factory finish coats of paint
42 of any material, fabricated steel or equipment to be installed shall be repaired by the
43 Subcontractor. Chipped or scratched areas shall be sanded or wire brushed to bare metal,
44 feathered and spot primed before finish paint is applied. All prime coats on structural steel
45 and miscellaneous metals that have been damaged, or affected by welding during erection,

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

**Document Type: Construction Specification
SPC Number: 352, Revision 1**

Project Number: 021052

1 shall be brushed, cleaned and painted with a prime coat after erection, except that painted
2 concealed surfaces shall be painted before erection. The paint for repair of finish painting
3 shall be the same color as the factory finish coat.
4

5 Protection: During painting operations, all equipment and materials shall be protected from
6 paint splatter with drop cloths, paper, masking tape or other approved means. Remove all
7 oily rags and waste. Take every precaution to avoid danger of fire.
8

9 Application: Paint shall be applied in such manner as to preclude runs, sagging, brush marks,
10 holidays or other defects in the finished surface. (No spray painting will be allowed within
11 buildings.) No painting shall be done when the ambient temperature is less than 50° F or
12 when the temperature during the drying period is apt to drop below 50° F. In areas of fresh
13 painted surfaces where the temperature has dropped below 45° F during the drying period,
14 the area shall be brought back to or above 45° F and the drying period extended to 48 hours.
15 All paint shall, otherwise, be applied in strict accordance with the paint manufacturer's
16 directions, including use of respirators where required by the manufacturer's instructions.
17

18 Cleanup: Upon the completion of the work, the Subcontractor shall remove all surplus
19 materials and rubbish and remove all paint spots from hardware, equipment, floors, glass and
20 walls, etc. He shall remove all excess materials and equipment from the premises and leave
21 the area in a clean and orderly condition.
22

23 IDENTIFICATION OF PIPING SYSTEMS:
24

25 Color Classification: Where a question arises as to proper color classification, the Contractor
26 should be consulted. The following list of conduit identifications are those which will be
27 used on this Subcontract:
28

	<u>Background/Lettering</u>
29 Electrical Conduit	Orange/Black
30 Water, Fire Protection	Red/White

31
32
33 Identification Labels: Identification shall be accomplished by use of labels or stenciling.
34 Straight lines of conduit and pipe shall be identified at intervals of 20 ft. Conduit and pipe
35 shall also be identified at approximately 2 ft from all turns, valves and upstream side of
36 distributional fittings or branches (exception: Piping in service racks). Horizontal conduit
37 which runs only in a service rack shall be identified at intervals of 20 ft.
38

39 The lettered label, besides identifying the materials in full English text (no abbreviations or
40 codes).
41

42 Application: Labels or stencils shall be applied to the pipe so that the lettering is in
43 the most legible position. Lettering size shall be in accordance with standards
44 specified in ASA-A13; however, nearest "Brady Labels" shall be acceptable (see
45 excerpt from American Standard).

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

**Document Type: Construction Specification
SPC Number: 352, Revision 1**

Project Number: 021052

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Conduits to be marked shall first be wiped clean of dirt, dust, grease and moisture. Apply label over color band, using pressure, so that it lies smooth and flat. Apply a brush coat of clear lacquer after label has been applied to conduit, making sure edges of label are well covered. Stencils may be used in lieu of labels without use of lacquer cover.

Size of Labels

Outside Diameter of Pipe of Covering (in.)	Width of Color Band A (in.)	Size of Legend Letters B (in.)
*1/4 to 3/4	8	-
3/4 to 1-1/4	8	-
1-1/4 to 2	8	3/4
2 to 6	12	1-1/4

(All dimensions are given in inches.)

10
11
12
13
14
15
16
17

FIELD QUALITY CONTROL:

Surveillance will be performed by the Contractor's Representative to verify compliance of the work to the drawings and specifications.

END OF SECTION 09900

Project Title: OU7-10 Glovebox Excavator Method Project
Site Development
Document Type: Construction Specification **Project Number: 021052**
SPC Number: 352, Revision 1

1 SECTION 13117—TEMPORARY FIRE RISER BUILDING

2

3 PART 1--GENERAL

4

5 SUMMARY:

6

7 Section Includes, but is not limited to:

8

9 Design, fabrication, and installation on-site of a temporary fire riser enclosure,
10 complete with all necessary accessories and components to assure a weather proof
11 enclosure for fire riser assembly as shown in drawings. Subcontractor shall be
12 responsible for coordinating all new work.

13

14 The Specific work to be accomplished includes to design a building to be constructed
15 on site or assembled off-site and moved on-site, ready to place on existing concrete
16 pad as shown on drawings. Setup shall include anchorage to existing concrete slab,
17 leveling, continuous seal around base, ready for use. Final product shall provide an
18 insulated enclosure with heat, lights and accessories necessary to protect the fire riser
19 assembly as shown in the construction documents.

20

21 Final connection to utilities, including water, power, alarms shall be by others.

22

23 Related Sections:

24

25 Section 03300 Cast In Place Concrete

26 Section 09900 Painting

27 Section 13505 Underground Fire Protection Piping

28 Section 13911 Dry Pipe Fire Sprinkler System

29 Section 13914 Manual Deluge Systems (Fire Hydrant and Future RCS)

30

31 REFERENCES:

32

33 The following documents, including others referenced therein, format part of this Section to
34 the extent designated herein.

35

36

NATIONAL CODES

37

38 IBC, 2000 International Building Code, 2000 Edition

39 NFPA 101 Life Safety Code, 2000

40 NFPA 70 National Electrical Code, 2002 Edition

41

42

Project Title: OU7-10 Glovebox Excavator Method Project
Site Development
Document Type: Construction Specification **Project Number:** 021052
SPC Number: 352, Revision 1

1		INDUSTRY STANDARDS
2		
3	ISDSI 102	Installation Standard for Insulated Steel Door Systems
4	SDI 100	Standard Steel Doors and Frames
5	SDI 108	Selection and Usage Guide for Standard Steel Doors
6	IES Handbook	Illuminating Engineering Society Handbook
7	NFPA 90B	Installation of Warm Air Heating and Air Conditioning Systems
8		
9		

10 SYSTEM DESCRIPTION:

11
12 Project Drawings: The project drawings do not attempt to show complete details of the site
13 utilities that affect the fire protection installation. The drawings in part are diagrammatic and
14 do not show all offsets, fittings, valves, equipment, etc. It is absolutely essential to study the
15 architectural, structural, mechanical, and electrical drawings and confer with the various
16 trades involved. This is necessary so that there is no conflict between the fire protection
17 system and the work of other trades and to assure that the Contractor secures the best
18 arrangement of work consistent with the use of space.

19
20 General Design Requirements: The Fire Riser building shall comply with the design
21 requirements for the following occupancy classifications and shall be laid out and installed in
22 accordance with the referenced codes and standards.

23
24 Group U, Type V-B Construction, as defined by the International Building Code,
25 2000 Edition

26
27 Industrial Special Use Occupancy, Low Hazard, as defined by the NFPA 101, 2000
28 Edition

29
30 Structural Design Loads: Structural considerations shall include the following:

31
32 Dead and Live Loads: per IBC, 2000

33
34 Snow: Design ground snow load of 35 lb/ft², minimum roof load of 30 psf

35
36 Wind: per IBC, 2000, 90 mph 3-second gust speed, Exposure C, Importance Factor
37 1.15

38
39 Seismic: per IBC, 2000, S_s= 0.357, S₁= 0.131, Site Class C. Seismic Importance
40 Factor 1.0, Seismic Use Group I

41
42 Construction Details: The Fire riser building shall, as a minimum, be designed and
43 manufactured to comply with the criteria listed below. Refer to Reference drawings for
44 location of the Fire Riser Building and associated site utilities, and site development.

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

**Document Type: Construction Specification
SPC Number: 352, Revision 1**

Project Number: 021052

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Size: Minimum interior dimension of building (inside of wall to inside of wall) shall be 8'-0" x 12'-6" with a minimum head clearance of 9'-0". The roof shall be a single slope to the west to accommodate draining to the concrete lined ditch. Slope shall be 3:12 minimum for shingles and 1:12 for prefinished metal roofing panels.

Wall and Roof Assembly: Constructed for a minimum R-19 walls and R-25 roof. Fiberglass insulation shall contain 20% recycled materials, Perlite composite board insulation shall contain 23% recycled materials, and plastic rigid foam, rigid polyisocyanurate/polyurethane, or rigid foam insulation shall contain 9% recycled materials.

Exterior Siding: Subject to review by Buyer, but minimum T-111 exterior grade wood siding, or minimum 26 ga. prefinished metal siding.

Roof: Subject to review by buyer, but minimum Architectural grade wind-lock asphalt shingles, or minimum 29 ga. prefinished metal roofing and trim.

Fire Rating: Materials shall have minimum flame-spread rating <24 and fuel contribution/smoke development <50.

Exterior Door: 36" x 84" insulated steel door, paint grade finish with Hollow Metal (H.M.) frame.

Hardware: Lever handle with keyed lock and deadbolt, weatherstrip seals and threshold. The lock must be capable of accepting and operating with 7 pin Best Universal Lock Co. No. 1E74 cylinder 1EC4 cam, which will be furnished and installed by the Contractor.

Color: Standard White for all finishes.

Interior Finishes: Minimum 29 ga. prefinished metal panels.

Sealant: Seal all vertical and horizontal joints and around penetrations, with elastomeric joint sealant, along exterior finish of building to insure weatherproof enclosure.

Anchorage: Anchor building to existing concrete slab with minimum 3/8" dia. X 8 inch minimum concrete embedment anchor bolts, 2'-0" oc at base plate.

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

Document Type: Construction Specification

Project Number: 021052

SPC Number: 352, Revision 1

1 Electrical: The electrical systems in the Fire Riser Building shall be in accordance with the
2 following provisions:
3

4 Incoming Service: A 120/240 Volt, 1 Phase, 3 Wire, 60 Hz electrical service is
5 available in the vicinity of the Fire Riser Building location. The total demand for the
6 Fire Riser building shall not exceed 30 amperes at 240 volts. The building shall be
7 supplied with a junction box on the outside for a single point connection of the
8 incoming service. The junction box shall be located on the north end of the building
9 on the outside wall in the vicinity of the electrical panel.

10
11 Interior Lighting: General interior lighting shall be provided by 2 tube, 2' X 4'
12 enclosed surface mounted fluorescent fixture(s). The fixture(s) shall be equipped
13 with high efficiency electronic ballasts and 32-watt high efficiency, low mercury,
14 fluorescent lamps. The lamps shall be designed to pass the Environmental Protection
15 Agency's Toxicity Characterization Leaching Procedure (TCLP) requirements at end
16 of life. The switch, controlling the fixtures, shall be close to the entrance to the
17 building. Illumination levels shall be as recommended by the Illuminating
18 Engineering Society Handbook.

19
20 Exterior Lighting: An exterior lighting fixture shall be located at the entrance. The
21 fixture shall be rated for exterior use, shall contain a 75-Watt High Pressure Sodium
22 Lamp and shall be Dark Sky compliant. The fixture shall be controlled by a
23 Photoelectric Cell that is an integral part of the fixture.

24
25 Standard Receptacles: Receptacles shall be provided in accordance with standard
26 industry practice for Fire Riser Buildings.

27
28 All standard single and duplex receptacles shall be specification grade, 20 Ampere,
29 125 Volts in a NEMA 5-20R configuration. The receptacles shall be Ground Fault
30 Circuit Interrupter (GFCI).

31
32 Labeling: All switches and receptacles shall be labeled to identify the source of
33 power including the panel designation, circuit number and voltage if other than 120
34 volts. Labels shall be firmly attached to the covers. Labels shall be engraved material
35 such as lamicoid or equivalent.

36
37 Wiring: Common neutrals i.e. Edison type circuits or multi-branch circuits shall not
38 be allowed. Where a neutral conductor is required, a dedicated neutral conductor
39 shall be provided for each phase conductor.

40
41 Code Compliance: The complete installation shall be in accordance with applicable
42 sections of the National Electrical Code (NEC). Provide required clearances per the
43 NEC.

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

**Document Type: Construction Specification
SPC Number: 352, Revision 1**

Project Number: 021052

1 Mechanical – Unit Heater: The Fire Riser Building shall be heated with a 120 V 2kW unit
2 heater to maintain the following conditions inside the Fire riser building:

3
4 Indoor temperature: 50°F Minimum

5
6 Outdoor temperature: -45°F Minimum

7
8 The system shall be designed with internal thermostatic control of the temperature.
9 Installation of the system shall conform to the manufacturer’s recommendations and
10 coordinated with the fire riser location to avoid interference.

11
12 Telephone and Data: Install a junction box on the outside north wall, 24” wide X 24” high X
13 6” deep, that shall have installed inside of it, punch down terminal strips that will be used for
14 the 6 pr of telephone circuits that will be extended from the WMF 657 telephone distribution
15 board under other parts of this project. Two of the telephone pairs will be used to transmit
16 fire alarm signals from the future Weatherproof Enclosure Structure (WES) to the CFA fire
17 Dispatch receiving equipment located in CF 666.

18
19 Fire Alarm: The Fire Riser Building shall be equipped with devices that will be connected to
20 the facility fire alarm system to be located in the proposed WES structure. Final connections
21 of each fire sprinkler riser to a water flow alarm switch, including system isolation valve with
22 electronic supervisory tamper switch shall be made during the future phase of construction. A
23 low building temperature supervisory switch set for 40°F, and low air pressure supervisory
24 switches for each of the two dry sprinkler systems shall be installed as part of the future
25 construction phase.

26
27 All interconnecting wiring will be installed in the next phase of the project.

28
29 Fire Protection: The Fire Riser Building shall provide weather protection for the 8-inch
30 underground fire water main and headers installed under other sections of this construction
31 documents package.

32
33 Subcontractor shall design and install the structure and support to accommodate seismic
34 bracing to support the seismic loads imposed by fire riser/fire water piping as shown in the
35 Construction Document Package. Reference Specification Sections 13911 and 13914 and
36 Fire Protection Drawings for configuration of fire water piping installation. Subcontractor
37 shall coordinate with fire sprinkler design/installation subcontractor for loads and provide
38 wall to support attachment of bracing.

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

**Document Type: Construction Specification
SPC Number: 352, Revision 1**

Project Number: 021052

1 SUBMITTALS:

2
3 The Subcontractor shall submit all data required by this specification to the Contractor for
4 review and approval. Vendor data includes but is not limited to the following:

5
6 Layout: The Fire Riser Building layout shall be submitted as a complete bound package for
7 review and approval by the Contractor. A complete package shall include all working plans,
8 shall indicate critical dimensions, weights, required clearance, components and location/size
9 of each field connection, including electrical, final fire riser connection and other vendor data
10 required by this specification section.

11
12 Partial submittals will be considered as incomplete and will not be reviewed. The layout
13 must be reviewed and receive an authorization to proceed by the Contractor prior to
14 beginning of installation.

15
16 Submit layout drawings in the requested medium and format, see Section 01300, Submittals.

17
18 An electronic copy of the As-Built configuration shall be furnished in addition to the original
19 drawing plots.

20
21 The Subcontractor shall submit a data package including the manufacturer's technical data
22 for procured components installed in the Fire Riser Building, including the door, lights,
23 heating unit, and major hardware components. The product data sheets shall identify
24 dimensions, weight, capacities, ratings and other interface information. Data packages shall
25 include the Operating and Maintenance Manuals for the Fire Riser Building and equipment
26 contained within the Fire Riser building such as the heating unit. The Subcontractor shall
27 include a recommended maintenance schedule for items requiring periodic servicing.

28
29 Calculations: The Subcontractor shall submit design calculations for the Seismic bracing
30 required per specification sections 13911 and 13914.

31
32 Drawings and Design Calculations shall be stamped by a Professional Engineer registered to
33 practice Civil or Structural Engineering in the State of Idaho.

34
35 Setup: Where structure is pre-manufactured off site, Subcontractor shall submit drawings
36 and other documents, as required, and clearly identify rigging loads, pick points, and general
37 setup instructions for the Fire Riser Building.

38
39 QUALITY CONTROL:

40
41 The Fire Riser building shall be fabricated using commercial assembly techniques, material,
42 and procedures typically used in the construction and assembly of similar structures.

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

**Document Type: Construction Specification
SPC Number: 352, Revision 1**

Project Number: 021052

1 Qualifications: The Fire Riser Building shall be furnished and constructed by a firm that is
2 qualified and regularly engaged in the design and fabrication of similar move-on or pre-
3 manufactured structures. Provide proof of experience, minimum five years, as a
4 manufacturer with a successful record of in-service performance in the fabrication and setup
5 of these structures and with the quality indicated. The Subcontractor shall maintain a shop
6 and facilities for fabrication of such structures.

7
8 Manufacturers: Firms regularly engaged in the manufacture of similar structures for not less
9 than 5 years.

10
11 Materials: Material, products and equipment shall be new and installed in accordance with
12 manufacturer's current published recommendations, the contract drawings, and these
13 specifications.

14
15 DELIVERY, STORAGE AND HANDLING:

16
17 All materials shall be delivered to and stored at the job site in a manner that will prevent
18 damage and foreign material from getting inside the piping and associated valving.

19
20 MATERIALS AND EQUIPMENT:

21
22 Materials, products and equipment shall be new and installed in accordance with
23 manufacturer's current published recommendations, the contract drawings, and these
24 specifications. Items used in quantity, such as valves and hardware shall in each case be the
25 product of one Subcontractor and shall be used only for the services recommended by the
26 manufacturer.

27
28 PART 3--EXECUTION

29
30 INSTALLATION:

31
32 Materials: The Fire Riser Building shall be fabricated using commercial assembly
33 techniques, materials, and procedures typically used in the construction and assembly of
34 similar structures.

35
36 FIELD QUALITY CONTROL:

37
38 One set of approved installation shop drawings shall be maintained on the project site during
39 construction. The Subcontractor shall redline all changes daily. The redline drawings shall
40 be incorporated on the "as-built" design drawings by the Subcontractor.

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

**Document Type: Construction Specification
SPC Number: 352, Revision 1**

Project Number: 021052

1 Inspections and Hold Points:

2

3 Witness and hold points are specific points in the activity requiring witnessing and/or
4 surveillance by the Buyer and Contractor. Activities shall not proceed past a hold point
5 without witness and/or surveillance by the Buyer and Contractor unless specifically waived
6 in writing by the Buyer. Hold points shall include inspection of lifting and rigging pick
7 points prior to lifting and setting for final installation. Buyer may establish the surveillance
8 of witness and hold points during the initial phase of work.

9

10 Deficiencies: The Subcontractor shall resolve all deficiencies, i.e. non-conformances as
11 noted, to the Buyer's and Contractor's satisfaction. The Buyer's and Contractor's
12 concurrence with "use-as-is" or "repair" disposition of any nonconformance must be
13 obtained. Such concurrence will not be unreasonably withheld. The terms "use-as-is,"
14 "repair," and "rework" are defined as:

15

- 16 • "Use-as-is" is a disposition permitted for a nonconforming item when it can be
17 established that the item is satisfactory for its intended use.
- 18 • "Repair" is the process of restoring a nonconforming characteristic to a condition such
19 that the capability of an item to function reliably and safely is unimpaired, even though
20 that item still does not conform to the original requirements.
- 21 • "Rework" is the process by which an item is made to conform to original requirements by
22 completion or correction.

23

24 Packing and Packaging: Prior to shipping, the Subcontractor shall protect openings in
25 housings and Building with plywood. Temporarily seal all open conduit connections, open
26 wiring, and conductors.

27

28 Marking and Handling: With the equipment shipping documents, the Subcontractor shall
29 provide complete identification and location of temporary material contained within the
30 equipment for shipment, handling or storage, which must be removed prior to
31 commissioning, including shipping blocks, desiccant bags, components shipped inside larger
32 sections, and provide instructions for removal, as required. The Subcontractor shall provide
33 written recommendations for field storage, transportation and handling of the Fire Riser
34 Building and its components and ancillary equipment.

35 Special Transportation Requirements: Where Fire Riser Building is pre-assembled off-site at
36 the Subcontractors facilities, the Subcontractor shall make arrangements and obtain permits
37 for transporting the Fire Riser Building from the Subcontractor's fabrication facility to the
38 INEEL Site approximately 60 miles west of Idaho Falls, ID. The Subcontractor shall be
39 responsible for protecting and transporting the Fire Riser Building to the Contractor's facility
40 at the INEEL.

41

42 The Subcontractor shall be responsible for dimensional stability and overall integrity of the
43 equipment during shipment. Any special lifting, rigging, or setting procedures shall be

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

Document Type: Construction Specification Project Number: 021052
SPC Number: 352, Revision 1

1 provided with the equipment. The center of gravity shall be clearly marked on the equipment
2 for hoisting and rigging purposes.

3 Delivery: Prior to shipment, at the discretion of the Buyer and Contractor, the Buyer and
4 Contractor may inspect the Fire Riser Building for conformance to this purchase
5 specification. The inspection will take place at the Subcontractor's manufacturing facility.
6 The Subcontractor shall not ship the building to the construction site until receiving written
7 authorization from the Buyer.

8
9 Surveillance will be performed by the Contractor's Representative to verify compliance of
10 the work to the drawings and specifications.

11
12 END OF SECTION 13117

Project Title: OU7-10 Glovebox Excavator Method Project
Site Development
Document Type: Construction Specifications **Project Number:** 021052
SPC Number: 352, Revision 1

1 SECTION 13505--UNDERGROUND FIRE PROTECTION PIPING

2
3 PART 1--GENERAL

4
5 SUMMARY:

6
7 Section Includes, but is not limited to:

8
9 Layout, fabricate, install, flush, and test a complete underground supply system
10 including pipe, fittings, valves, thrust blocks, rodded connections, supports, bracing,
11 expansion joints, and all necessary accessories and components to assure a complete
12 and operable system. Subcontractor shall be responsible for coordinating all new
13 work.

14
15 The Specific work to be accomplished under this specification is to connect to an
16 existing 8-inch underground pipe and to install an extension of that piping as shown
17 on the drawings to a new Fire Riser Building. The Fire Riser Building shall be
18 provided by others.

19
20 If water is not available at the location shown on the drawings, provide a fixed-price,
21 add alternate to extend the 8-inch underground main to the tee fitting on the existing
22 main as shown on the drawings. The new main is to be located in the same place as
23 the existing underground water main. This specification section also includes
24 information to be used for the alternative.

25
26 Related Sections:

27
28 Section 01300 Submittals
29 Section 02200 Earthwork
30 Section 13117 Temporary Fire Riser Building
31 Section 13911 Dry Pipe Fire Protection System
32 Section 13914 Manual Deluge Systems (Fire Hydrant and Future RCS)

33
34 REFERENCES:

35
36 The following documents, including others referenced therein, form part of this Section to
37 the extent designated herein.

38
39 AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

40
41 ANSI/AWWA C150/A21.4 Cement Mortar Lining for Ductile Iron Pipe and
42 Fittings for Water

43 ANSI/AWWA C150/A21.50 Thickness Design of Ductile Iron Pipe

44 ANSI/AWWA C150/A21.51 Ductile Iron Pipe, Centrifugally Cast for Water

45

Project Title: OU7-10 Glovebox Excavator Method Project

Site Development

Document Type: Construction Specifications

Project Number: 021052

SPC Number: 352, Revision 1

1 Depth of bury shall be not less than 6 ft. to the top of pipe. Any depth of bury less than 6 ft.
2 will require pre-authorization by the INEEL Fire Marshall. The firewater pipeline shall be 8
3 inch from the connection to the existing main into the fire riser building.
4

5 Control Valves: The PIV shall be provided with electronic valve supervision capabilities.
6

7 SUBMITTALS:
8

9 Layout: The fire water supply system layout shall be submitted as a complete bound package
10 for review and approval by the Contractor. Complete packages shall include thrust block
11 calculations, thrust block details, and piping method/materials including make and model of
12 all equipment used.
13

14 The submitted layout shall comply with NFPA 13, NFPA 14, & NFPA 24 and include all
15 piping, offsets, fittings, hangers, lighting, and obstructions. *Partial submittals will be*
16 *considered as incomplete and will not be reviewed.* The layout must be reviewed and receive
17 an authorization to proceed by the Contractor prior to beginning of installation.
18

19 The Subcontractor shall submit all layout drawings for review and authorization to proceed
20 prior to construction. All drawings shall be CAD generated and completed on size D
21 (22 × 34 in.) drawings. Lettering size shall be a minimum of 1/8 (.125)" inch for all lettering
22 on the main body of the drawing. Border and title block shall follow format in this drawing
23 package. An electronic copy in AutoCAD 2000, DWG format, shall be furnished in addition
24 to the original drawing plots. Electronic copies of border and title block format is available
25 upon request. An A/E Drawing Standard format is available upon request.
26

27 One set of approved fire protection design drawings shall be maintained on the project site
28 during construction. The Subcontractor shall redline all changes daily. The redline drawings
29 shall be incorporated on the "as-built" design drawings by the Subcontractor.
30

31 As-built drawings in electronic form shall be submitted in addition to.
32

33 Quality Control Submittals:
34

35 Procedures: The Subcontractor shall submit a detailed hydrostatic test procedure and
36 a detailed flushing procedure.
37

38 The Subcontractor shall submit a flushing procedure outlining where the flushing
39 water will be obtained and how it will be disposed of in a safe manner. The test water
40 shall not be disposed on the Pit 9 Surface. The procedure shall outline how the test
41 water is to be disposed of to prevent any scour or erosion or silt from entering the
42 Main Channel Flow System (MCFS). The procedure shall also outline how the flow
43 will be monitored to assure adequate flow and how long the flow must be maintained
44 to adequately flush the piping. The discharge of water from the flushing shall not be

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

**Document Type: Construction Specifications Project Number: 021052
SPC Number: 352, Revision 1**

1 allowed to flow onto the Pit 9 underground storage. There is a catch basin located in
2 the southeast corner of Pit 9 that can be used to contain the flushing water. This
3 procedure must be submitted for review prior to any connections to existing plant
4 piping.
5

6 Certifications: A Contractor's Material and Test Certification for Underground
7 Piping shall be completed and accepted, for each major portion of the work covered
8 by this specification prior to final acceptance of the installation. Reference
9 Attachment 'A'.

10
11 Qualifications: Submit documentation showing the qualifications of the NICET
12 Certified Technician Level III for this project.
13

14 Manufacturer: Submit documentation showing the pipe manufacturer's products have
15 been in satisfactory service for five or more years.
16

17 Installer: Submit documentation showing the installation company for this project has
18 three or more years of successful installation experience. The installation company
19 shall also submit a photocopy of their State of Idaho license as a Fire Protection
20 Sprinkler Subcontractor.
21

22 See Section 01300, Submittals and the Vendor Data Schedule for additional submittal
23 requirements.
24

25 QUALITY CONTROL: 26

27 Qualifications: The Subcontractor for the underground fire water system shall have a NICET
28 Certified Engineering Technician (CET) in Fire Protection with a minimum Level III rating,
29 responsible for overseeing the preparation of the layout drawings, thrust block calculations,
30 hydraulic calculation, and installation. This person shall be required to certify that the
31 drawings are in accordance with this specification and all the regulatory requirements. All
32 drawings and calculations shall be signed by the CET.
33

34 Manufacturers: Firms regularly engaged in the manufacture of firewater piping and
35 accessories of types and sizes required, whose products have been in satisfactory use in
36 similar service for not less than 5 years.
37

38 Installer: A firm with at least 3 years of successful installation experience on projects with
39 underground firewater piping similar to that required for this project. The installing
40 Subcontractor shall be licensed, by the State of Idaho, as a Fire Protection Sprinkler
41 Subcontractor.
42

43 Materials: Provide piping, fittings, and devices with a UL listing and FM approval.
44

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

**Document Type: Construction Specifications Project Number: 021052
SPC Number: 352, Revision 1**

1 Regulatory Requirements (Codes and Standards): Comply with the provisions of the
2 following codes and standards unless otherwise specified herein.

3
4 NFPA 13
5 NFPA 14
6 NFPA 24
7

8 DELIVERY, STORAGE AND HANDLING:
9

10 All materials shall be delivered to and stored at the job site in a manner that will prevent
11 foreign material from getting inside the piping, associated valving, and equipment.
12

13 SEQUENCING /SCHEDULING:
14

15 The underground fire water main must be flushed and accepted prior to connection to the
16 sprinkler system riser header.
17

18 PART 2--PRODUCTS
19

20 MATERIALS AND EQUIPMENT:
21

22 Ductile Iron Pipe: Ductile-Iron Pipe shall be AWWA C151 Class 200 and lined. Lining shall
23 be AWWA C104 cement mortar, seal coated. Joints shall be push-on type or mechanical
24 joint with rubber gaskets, ductile- or cast-iron glands, and high-strength steel bolts and nuts
25 per AWWA C111. Ductile iron pipe shall be U.S. Pipe, American Pipe or Tyler Pipe.
26 Lubricant shall be used for rubber gaskets and conform to AWWA C111.
27

28 Ductile Iron Fittings: Underground fittings shall be ductile iron mechanical or slip joint, and
29 conform to the mechanical properties of ANSI/AWWA C151/A21.51, UL Listed, cement
30 lined per AWWA C104/A121.4. The piping shall be rated for a working pressure of 175 psi,
31 and rated truckload of AASHTO H-20 unpaved road, and 1.5 impact factor and calculations
32 according to ANSI/AWWA C150/A21.50 and C150/A21.51. Fittings shall be U.S. Pipe,
33 American Pipe or Tyler Pipe, Models Tyton Joint and/or Mechanical Joint.
34

35 Rodding: Studs or threaded rod shall conform to ASTM A307 Grade B and use nuts that
36 conform to ASTM A563 Grade A, heavy hex. Washers shall be steel or ASTM A126 class-
37 A cast iron, round or square as required. Rod couplings or turnbuckles shall be ASTM A197
38 malleable iron.
39

40 Post Indicating Valve (PIV): PIV's shall consist of a UL listed, FM approved, resilient
41 wedge gate valve and indicator post from the same manufacture. The valve shall be
42 mechanical joint or flanged, Clow Model F-6120 or Waterous Series 500. The valve shall be
43 equipped with an electronic tamper switch, Potter Model PIVS-B for connection by the fire

Project Title: OU7-10 Glovebox Excavator Method Project
Site Development
Document Type: Construction Specifications **Project Number: 021052**
SPC Number: 352, Revision 1

1 alarm system contractor to the fire alarm control panel or existing circuit as a supervisory
2 signal.

3
4 Key Valve with Road Box: Key valves shall be resilient wedge gate valve, Clow Model F-
5 6100 or Waterous Series 500. The valves shall have mechanical joint, flanged, or other
6 approved ends. Provide 4 in. cast ductile iron valve stand pipe, road/curb box and key valve
7 wrench.

8
9 Set Screw Retaining Gland: Provide set screw retaining gland and associated screws. Use
10 Megalug Series 2000PV for PVC pipe. Use Megalug Series 1100 for mechanical joint pipe
11 restraint and Megulug Series 1700 for push-on (pipe bells) joints. Gland shall be UL listed
12 and FM approved.

13
14 Uni-Flange: Ductile iron adapter flange, Tyler/Union Pipe.

15
16 Identification of Piping: New underground pipelines shall be identified by use of a plastic
17 ribbon no less than 3 in. in width with a message printed on the ribbon that identifies the
18 actual pipeline contents. The plastic ribbon shall be color coded in conformance with the
19 following:

20
21

<u>Categories of Pipeline Contents</u>	<u>Tape</u>	<u>Lettering</u>
Fire Water	Red	White

22
23
24
25

26 PART 3--EXECUTION

27
28 FIELD QUALITY CONTROL:

29
30 One set of approved installation shop drawings shall be maintained on the project site during
31 construction. The Subcontractor shall redline all changes daily. The redline drawings shall
32 be incorporated on the "as-built" design drawings by the Subcontractor.

33
34 Materials: Only new and approved pipe, fittings, and devices shall be employed in the
35 installation of the underground system.

36
37 Installation: A 2'-0" square opening shall be constructed of 2" rigid insulation and installed
38 around the pipe passing through the floor of the new riser house. Coordinate with structural
39 subcontractor.

40
41 A uni-flange shall be provided on the riser approximately 2 inches above the finished floor.
42 The uni-flange shall be rodded to the elbow located beneath the floor. Rodding shall extend
43 from the elbow to the first joint past the building foundation.

44

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

**Document Type: Construction Specifications
SPC Number: 352, Revision 1**

Project Number: 021052

1 Where cut in sleeves are used in this installation a spacer shall be installed in the sleeve and
2 set screw retaining glands shall be used on each side of the sleeve.

3
4 Thrust blocks: Forms shall be used in the placement of the thrust blocks. If the thrust blocks
5 cannot be placed against undisturbed soil it will be permissible to compact the soil behind the
6 thrust block to a minimum of 95% proctor.

7
8 Underground pipe identification: Ribbon shall be spiral wrapped around the pipeline at no
9 less than 1 wrap per 3 ft of run.

10
11 Locator Ribbon: See specification section 02200.

12
13 Acceptance Tests:

14
15 Flushing of Piping: New underground mains and lead-in connections to system risers
16 shall be flushed thoroughly immediately after tie-in to system is made or before
17 connection is made to the sprinkler piping.

18
19 A flow of 1560 gpm (8 inch line) must be produced to achieve a velocity of 10 ft/sec,
20 which is necessary, for cleaning the pipe and for lifting foreign material to an above-
21 ground flushing outlet per NFPA 24. If this flow rate cannot be achieved, contact the
22 Contractor's Representative.

23
24 Hydrostatic Test Procedure: All new underground Fire System piping shall be
25 hydrostatically tested at not less than 225-psi pressure for two hours.

- 26
27
- 28 1. Slowly fill with water each section of the main to be tested.
 - 29 2. Expel all air by opening hydrants at the highpoints of the system and at both
30 ends, or by bleeding air through the sprinkler drains.
 - 31 3. Open wide the valve controlling the admission of water before shutting the
32 hydrants or drains.
 - 33 4. After the system has been filled with water and the entrapped air expelled,
34 close the valve controlling the section being tested and begin applying
35 pressure.
 - 36 5. Increase the water pressure in 50-psi (345 kPa, 3.5 bar) increments until the
37 specified test pressure is attained.
 - 38 6. After each increase in pressure, make observations of the stability of the
39 joints. In these observations, include such items as protrusion or extrusion of
40 the gasket, leakage or other factors likely to affect the continued use of a pipe
41 in service.
 - 42 7. During the test increase the pressure to the next increment only after the joint
43 has been determined to be stable. This applies particularly to movement of the
44 gasket.
 8. After the pressure has been increased to the required maximum value and held

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

**Document Type: Construction Specifications
SPC Number: 352, Revision 1**

Project Number: 021052

1 for one hour.
2 9. Decrease the pressure to 0 psi (0 kPa, 0 bar) while observing for leakage.
3 Then slowly increase the pressure to the specified maximum and hold the
4 pressure for one more hour.
5

6 **Warning:** Do not use the fire pumps to supply pressure. A pipeline break during
7 testing could result in damage from the large flow of escaping water. Instead, use a
8 small hydrostatic test pump.
9

10 CLEANING:

11

12 Flushing of Piping: New underground mains and lead-in connections to system risers shall
13 be flushed thoroughly immediately after tie-in to system is made.
14

15

16 Pipe Flushing Procedure: Upon completion of installation, the system shall be filled and
17 drained at least two (2) times. Water shall be run through the end of the line until clear and
18 water discharged to an approved location.

19

20 Testing and flushing shall be witnessed by the Contractor's Representative. The test water
21 shall not be disposed of on the Pit 9 Surface. The test water may be disposed of in the Main
22 Channel Flow System (MCFS) in accordance with the Subcontractors approved disposal
23 plan. Scour and erosion of soils shall be prevented. Sedimentation will not be allowed in the
24 MCFS. There is a catch basin located in the southeast corner of Pit 9 that can be to contain
25 the flushing water. The disposal of the test water shall be coordinated with RWMC
26 operations. System shall be left in a drained condition.

27

28 Surveillance will be performed by the Contractor's Representative to verify compliance of
29 the work to the drawings and specifications

30

END OF SECTION 13505

Attachment A

Contractors Material and Test Certificate for Underground Piping

CONTRACTOR'S MATERIAL AND TEST CERTIFICATE FOR UNDERGROUND PIPING

PROCEDURE	
Upon completion of work, inspection, and tests shall be made by the contractor's representative and witnessed by an owner's representative. All defects shall be corrected and system left in service before contractor's personnel finally leave the job.	
A certificate shall be filled out and signed by both representatives. Copies shall be prepared for approving authorities, owners, and contractor. It is understood the owner's representative's signature in no way prejudices any claim against contractor for faulty material, poor workmanship, or failure to comply with approving authority's requirements or local ordinances.	
Property Name	Date
Property Address	
PLANS	Accepted by approving authorities (names)
	Address
	Installation conforms to accepted plans <input type="checkbox"/> YES <input type="checkbox"/> NO Equipment used is approved <input type="checkbox"/> YES <input type="checkbox"/> NO If no, state deviations
INSTRUCTIONS	Has person in charge of fire equipment been instructed as to location of control valves and care and maintenance of this new equipment? If no, explain <input type="checkbox"/> YES <input type="checkbox"/> NO
	Have copies of appropriate instructions and care and maintenance charts been left on premises? If no, explain <input type="checkbox"/> YES <input type="checkbox"/> NO
LOCATION	Supplies Buildings
UNDERGROUND PIPES AND JOINTS	Pipe Types and Class Type Joint
	Pipe conforms to _____ Standard <input type="checkbox"/> YES <input type="checkbox"/> NO Fittings conform to _____ Standard <input type="checkbox"/> YES <input type="checkbox"/> NO If no, explain
	Joints needing anchorage clamped, strapped, or blocked in accordance with _____ Standard <input type="checkbox"/> YES <input type="checkbox"/> NO If no, explain
TEST DESCRIPTION	<p>Flushing: Flow the required rate until water is clear as indicated by no collection of foreign material in burlap bags at outlets such as hydrants and blow-offs. Flush at flows not less than 390 GPM (1476 L/min) for 4-inch pipe, 880 GPM (3331 L/min) for 6-inch pipe, 1560 (5905 L/min) for 8-inch pipe, 2440 GPM (9235 L/min) for 10-inch pipe, and 3520 GPM (13323 L/min) for 12-inch pipe. When supply cannot produce stipulated flow rates, obtain maximum available and concurrence of the INEEL Fire Marshall.</p> <p>Hydrostatic: Hydrostatic tests shall be made at not less than 200 psi (13.8 bars) for two hours or 50 psi (3.4 bars) above static pressure in excess of 150 psi (10.3 bars) for two hours.</p> <p>Leakage: New pipe laid with rubber gasketed joints shall, if the workmanship is satisfactory, have little or no leakage at the joints. The amount of leakage at the joints shall not exceed 2 qts. Per hr. (1.89 L/h) per 100 joints irrespective of pipe diameter. The leakage shall be distributed over all joints. If such leakage occurs at a few joints the installation shall be considered unsatisfactory and necessary repairs made. The amount of allowable leakage specified above may be increased by 1 fl oz per in. valve diameter per hr. (30 mL/25 mm/h) for each metal seated valve isolating the test section. If dry barrel hydrants are tested with the main valve open, so the hydrants are under pressure, an additional 5 oz per minute (150 mL/min) leakage is permitted for each hydrant.</p>
FLUSHING TESTS	New underground piping flushed according to approved flushing procedure dated _____ <input type="checkbox"/> YES <input type="checkbox"/> NO by _____ (company) If no, explain
	How flushing flow was obtained Through what type opening <input type="checkbox"/> Public Water <input type="checkbox"/> Tank or Reservoir <input type="checkbox"/> Fire pump <input type="checkbox"/> Hydrant butt. <input type="checkbox"/> Open pipe Give C factors and pitot readings in comment section.
	Lead-ins flushed according to approved flushing procedure dated _____ <input type="checkbox"/> YES <input type="checkbox"/> NO by _____ (company) If no, explain
	How flushing flow was obtained Through what type opening <input type="checkbox"/> Public Water <input type="checkbox"/> Tank or Reservoir <input type="checkbox"/> Fire pump <input type="checkbox"/> Y conn. To flange and spigot <input type="checkbox"/> Open pipe

Project Title: OU7-10 Glovebox Excavator Method Project
Site Development
Document Type: Construction Specifications **Project Number:** 021052
SPC Number: 352, Revision 1

1 SECTION 13911--DRY PIPE FIRE PROTECTION SYSTEMS

2
3 PART 1--GENERAL

4
5 WORK INCLUDED: Work includes, but is not limited to:

6
7 Layout, fabricate, install, flush, and test the dry pipe fire systems including pipe,
8 fittings, hangers, supports, earthquake bracing, flexible joints, and all necessary
9 accessories and components to assure complete and operable systems.

10
11 Design and install the two dry pipe fire system risers in the Fire Riser Building as
12 shown on the drawings and which are connected to an 8-inch riser system header
13 installed as part of this project and specified in specifications Section 13914 for the
14 Manual Fire Hydrant System.

15
16 Install air compressors for each of the two Dry Sprinkler System Risers that will have
17 the capability to fill up the system to the minimum pressure required to reset the
18 individual Dry Sprinkler Systems within 30 minutes from the time that filling begins.
19 The air shall be dried using desiccant air dryers to minimize the moisture that enters
20 the systems during pressurization. Use 500 gallons volume for each of the two dry
21 systems to determine the compressor size to achieve the 30-minute reset time
22 requirement.

23
24 Design, construct and install pipe support structures as shown on the plans to support
25 the four fire sprinkler systems leaving the Riser Building and extending to within 10
26 feet of the WES as shown on the drawings.

27
28 RELATED SECTIONS:

29
30 Section 01300 Submittals
31 Section 13117 Temporary Fire Riser Building
32 Section 13114 Manual Deluge Systems (Fire Hydrant and Future RCS)
33 Section 13505 Underground Fire Protection Piping

34
35 REFERENCES:

36
37 The following documents, including others referenced therein, form part of this Section to
38 the extent designated herein.

39
40 INTERNATIONAL CONFERENCE OF BUILDING OFFICIALS (ICBO)

41
42 IBC International Building Code 2000

Project Title: OU7-10 Glovebox Excavator Method Project
Site Development
Document Type: Construction Specifications **Project Number:** 021052
SPC Number: 352, Revision 1

1 NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)
2
3 NFPA 13 Standard for the Installation of Sprinkler Systems
4
5 FACTORY MUTUAL (FM)
6
7 FM Approval Guide Fire Protection
8 FM Data Sheet 2-8
9
10 UNDERWRITERS LABORATORY, INC. (UL)
11
12 UL Directory Fire Protection Equipment
13

14 SYSTEM DESCRIPTION:

15
16 Subcontract Drawings: The subcontract drawings do not attempt to show complete details of
17 the building construction, and the dry pipe fire protection system which affect the fire
18 protection installation. The drawings in part are diagrammatic and do not show all offsets,
19 fittings, valves, equipment, etc. It is absolutely essential to study all subcontract drawings
20 and coordinate with the various trades involved.
21

22 Layout Requirements: The dry pipe fire protection system shall be laid out and installed in
23 accordance with the referenced codes and standards.
24

25 The water supply information available for use in the hydraulic calculations is a static
26 pressure of 150-psi with a residual pressure of 145-psi flowing 950 gpm at the point of
27 connection to the underground pipe, Valve 8 "FW-PIV-DM04." The final hydraulic
28 requirements shall result in a water supply demand a minimum of 10% below the water
29 supply curve.
30

31 Piping: All above ground piping used in this project for dry fire systems shall conform to the
32 Product section of this specification, 13911. Piping leading from the fire department pumper
33 connection to the 8" system pipe header, piping leading from the underground main, and all
34 other piping shall be galvanized piping.
35

36 Air Supply: The dry pipe valve and associated air maintenance device shall be arranged to
37 avoid tripping due to water pressures of 160 psig. The air supply for this installation shall be
38 obtained from a riser mounted air compressor. The air compressors shall be provided with an
39 air dryer and filter assembly. The air system shall be sized based upon a dry pipe sprinkler
40 system volume of 500 gallons as a minimum.
41

42 Seismic Bracing: Earthquake sway bracing shall be provided based upon NFPA 13 and FM
43 Data Sheets 2-8 using a "G" factor of 0.5. Calculations, using the zone of influence method,
44 showing the forces on the attachments shall be done to verify that the minimum requirements
45 outlined are not exceeding the allowable strengths of listed equipment or allowable strength

Project Title: OU7-10 Glovebox Excavator Method Project

Site Development

Document Type: Construction Specifications

Project Number: 021052

SPC Number: 352, Revision 1

1 of the building structure at the point of attachment. Details of the sway bracing shall be
2 provided on the shop drawings and bracing calculation sheets.

3
4 The subcontractor shall be responsible for coordinating with the building manufacture to
5 assure the structure is capable of supporting both the static and dynamic loads imposed by
6 the automatic sprinkler system layout. The forces developed at the point of connection to the
7 structure must be taken into account and approved by the building structural designer.

8
9 Control Valves: All valves controlling fire protection water supplies shall be provided with
10 electronic valve supervision capabilities.

11
12 Splash Blocks: The Subcontractor shall furnish splash blocks at the main drain(s) and all
13 other exterior discharge locations that do not drain onto asphalt.

14
15 SUBMITTALS:

16
17 Layout: The dry pipe fire protection system layout shall be submitted as a complete bound
18 package for review and approval by the Contractor. A complete package shall include all
19 working plans, hydraulic calculations, sway bracing calculations, and other vendor data
20 required by this specification section.

21
22 Working plans shall contain all information required by NFPA 13 and include all piping,
23 offsets, fittings, hangers, lighting, and obstructions. *Partial submittals will be considered as*
24 *incomplete and will not be reviewed.* The layout must be reviewed and receive an
25 authorization to proceed by the Contractor prior to beginning of installation.

26
27 The Subcontractor shall submit all layout drawings for review and authorization to proceed
28 prior to construction. All drawings shall be CAD generated and completed on size D
29 (22 × 34 in.) drawings. Lettering size shall be a minimum of 1/8 (.125)" inch for all lettering
30 on the main body of the drawing. Border and title block shall follow format in this drawing
31 package. An electronic copy in AutoCAD 2000, DWG format, shall be furnished in addition
32 to the original drawing plots. Electronic copies of border and title block format is available
33 upon request. An A/E Drawing Standard format is available upon request.

34
35 As-built drawings in electronic form shall be submitted. Additionally, electronic As-built
36 hydraulic calculations, compatible with HASS 7.3 shall be submitted with the drawings.

37
38 Quality Control Submittals:

39
40 Procedures: The Subcontractor shall submit a detailed hydrostatic test procedure and
41 a detailed flushing procedure.

42
43 The Subcontractor shall submit a flushing procedure. The procedure shall describe
44 where water will be obtained and how it will be disposed after the testing in a safe
45 manner. The test water shall not be disposed on the Pit 9 Surface.

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

Document Type: Construction Specifications

Project Number: 021052

SPC Number: 352, Revision 1

1 The procedure shall outline how the test water is to be disposed of to prevent any
2 scour or erosion or silt from entering the Main Channel Flow System (MCFS). There
3 is a catch basin located in the southeast corner of Pit 9 that can be to contain the
4 flushing water. The procedure shall also outline how the flow will be monitored to
5 assure adequate flow and how long the flow must be maintained to adequately flush
6 the piping. The discharge of water from the flushing shall not be allowed to flow onto
7 the Pit 9 underground storage. There is a catch basin located in the southeast corner
8 of Pit-9 that can be used to contain flushing water. This procedure must be submitted
9 for review prior to any connections to existing plant piping.

10
11 Certifications: A Contractor's Material and Test Certification for Above-Ground
12 Piping shall be completed and accepted, for each dry pipe system covered by this
13 specification prior to final acceptance of the installation. Reference Attachment 'A'.

14
15 Test Reports: A final inspection form shall be submitted for the automatic sprinkler
16 system installed or modified by this project.

17
18 Qualifications: Submit documentation showing the qualifications of the NICET
19 Certified Technician Level III for this project.

20
21 Manufacturer: Submit documentation showing the pipe manufacturer's products have
22 been in satisfactory service for five or more years.

23
24 Installer: Submit documentation showing the installation company for this project has
25 three or more years of successful installation experience. The installation company
26 shall also submit a photocopy of their State of Idaho license as a Fire Protection
27 Sprinkler Subcontractor.

28
29 Thrust Restraint: Submit thrust restraint calculations and sketches.

30
31 See Section 01300, Submittals and the Vendor Data Schedule for additional submittal
32 requirements.

33
34 QUALITY CONTROL:

35
36 Qualifications: The Subcontractor for the dry pipe fire protection system shall have a NICET
37 Certified Engineering Technician, (CET), in Fire Protection with a minimum Level III rating
38 in Fire Protection responsible for overseeing the preparation of the layout drawings and
39 installation. This person shall be required to certify that the drawings are in accordance with
40 this specification and all referenced regulatory requirements. All drawings shall be signed by
41 the CET.

42
43 Manufacturers: Firms regularly engaged in the manufacture of fire sprinklers and piping
44 accessories of types and sizes required, whose products have been in satisfactory use in
45 similar service for not less than 5 years.

Project Title: OU7-10 Glovebox Excavator Method Project
Site Development
Document Type: Construction Specifications **Project Number: 021052**
SPC Number: 352, Revision 1

1 Installer: A firm with at least 3 years of successful installation experience on projects with
2 fire sprinkler piping similar to that required for this project. The installing Subcontractor
3 shall be licensed by the State of Idaho as a Fire Protection Sprinkler Subcontractor.
4

5 Materials: Provide sprinkler piping, fittings, and devices with a UL listing or FM approval.
6

7 Regulatory Requirements (Codes and Standards): Comply with the provisions of the
8 following codes and standards unless otherwise specified herein.
9

10 NATIONAL FIRE PROTECTION ASSOCIATE (NFPA)

11
12 NFPA 13 "Standard for the Installation of Sprinkler Systems"

13 FACTORY MUTUAL (FM)

14
15
16 Approval Guide for Fire Protection
17

18 Notification: The Subcontractor shall notify the Contractor in writing two weeks prior to
19 beginning work.
20

21 Workmanship: All work shall be done in a skillful and workmanlike manner. No
22 modifications or rearrangements, not shown on the drawings, shall be made without prior
23 approval from the Contractor.
24

25 Upon completion of the dry pipe fire protection systems installation, the individual with the
26 NICET level III responsible for the system layout, shall conduct the final main drain test and
27 verify the installation has been installed in accordance with the working drawings and meets
28 the layout requirements of this specification.
29

30 DELIVERY, STORAGE AND HANDLING:

31
32 All materials shall be delivered to and stored at the job site in a manner which will prevent
33 foreign material from getting inside the piping and valving and equipment.
34

35 SEQUENCING/SCHEDULING:

36
37 The static and dynamic loads associated with the fire protection system must be coordinated
38 with the fire riser building structural design.
39

40 PART 2--PRODUCTS

41
42 MATERIALS AND EQUIPMENT:

43
44 Piping: Piping shall be welded or seamless galvanized steel, Schedule 40, conforming to the
45 requirements of ASTM A-53 or A-795 and NFPA 13. Schedule 10 UL listed or FM

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

Document Type: Construction Specifications

Project Number: 021052

SPC Number: 352, Revision 1

- 1 approved, or ASTM A-795. Welding will not be allowed on galvanized piping unless the
2 weld effect area is hot dip galvanized after welding is completed.
3
- 4 Pipe Fittings: Fittings shall be hot dipped galvanized in accordance with the requirements set
5 forth in NFPA 15. Reduction in pipe size shall be made with one-piece reducing fittings.
6 Bushings will not be acceptable. Plain-end fittings are not acceptable.
7
- 8 Welded fittings on galvanized piping will not be allowed unless the weld effected zone of the
9 fitting and associated piping is hot dip galvanized.
10
- 11 Pipe Couplings: Flexible galvanized couplings in pipelines shall be UL listed or FM
12 approved and they shall be in conformance with NFPA 15 using Victaulic, Style 75. The
13 grooving machine used to prepare the pipeline to accept the flexible couplings shall be
14 approved for use with the coupling by the coupling manufacturer.
15
- 16 Rigid couplings in pipelines shall be Victaulic Style 005, 07. The grooving machine used to
17 prepare the piping to accept the rigid couplings shall be approved for use with the coupling
18 by the coupling manufacturer.
19
- 20 Plain end and welded couplings shall not be allowed.
21
- 22 Fire Department Connections: Shall be of the siamese type, 2½ x 2½ x 4 in. and shall have
23 two 2½ in. female swivel connections with National Standard fire hose threads. The fire
24 department connections shall be Potter-Roemer Model 5710. Two 2½ in. plugs shall be
25 included and shall be Potter-Roemer Model 5950. An identification plate labeled
26 "AUTOSPKR" shall be provided.
27
- 28 Control Valves:
29
- 30 Butterfly Valve: A butterfly valve with weather proof actuator housing, have a positive
31 indication for the open and closed position, and be pre-wired for valve supervision. It shall
32 be Victaulic Series 708-W.
33
- 34 Outside Screw and Yoke (OS&Y): Valves shall be UL listed and FM approved. American
35 Flow Control, Series 500.
36
- 37 Water Motor Alarm Gong: The water motor alarm shall be Viking Series 760 with Retard
38 Chamber, Series 752, unless otherwise directed by the cognizant Fire Protection Engineer.
39
- 40 Dry Pipe Valve: The dry pipe valve shall use a positive latching mechanism and be complete
41 with factory supplied trim, including a water motor alarm, water flow alarm switch, and low
42 pressure air switch. The valve shall be UL listed and FM approved. Victaulic Series 756,
43 with proper trim.
44

Project Title: OU7-10 Glovebox Excavator Method Project

Site Development

Document Type: Construction Specifications

Project Number: 021052

SPC Number: 352, Revision 1

1 Air Maintenance Device: This device shall reduce the pressure of the in coming air supply in
2 order to maintain system air pressure. The air maintenance device shall be by the same
3 manufacture as the dry pipe valve.
4

5 Air Compressor: The air compressor shall be a system with capabilities to be mounted on an
6 adjacent building wall. The air compressor shall be a General Air Compressor Corp
7 Maintenance Air Compressor. Use 500 gallons as the design capacity of the system and to
8 determine the quantity of air needed to fill the system within 30 minutes.
9

10 Air Dryer: Air dryers shall be the inline desiccant type designed to provide a dew point of at
11 least -20° F. A coalescing type prefilter shall be provided with the air dryers.
12

13 Check Valves:

14
15 Swing Check: Swing check valves shall have a removable faceplate to allow for
16 maintenance of the valve without the need of removing it from the system. Viking
17 model G-1.
18

19 Water Flow Pressure Alarm Switch: Pressure type water flow alarm switch with built
20 in recycling pneumatic retard and two sets of SPDT contacts shall be provided as part
21 of the Alarm Valve trim. Potter-PS10-2 Pressure Type Flow Switch.
22

23 Earthquake and Sway Bracing: Bracing shall be UL listed or designed by a registered
24 Professional Engineer in the State of Idaho. Bracing by TOLCO.
25

26 Signs: All drain and test valves shall have identification signs per NFPA 13. Lettering shall
27 be a minimum of ½ in. high white letters on red background.
28

29 Splash Block: Splash blocks shall be constructed of concrete.
30

31 Low Air Pressure Switch: Provide as a part of the dry pipe valve trim a low air pressure
32 switch with two (2) sets of SPDT contacts. Pressure switch shall be Potter PS40-2.
33

34 PAINTING AND IDENTIFICATION OF PIPING

35
36 See Section 09900 Painting, for the requirements of painting and labeling all pipe, fittings,
37 and hangers and devices. Galvanized or SST piping need not be painted but shall be labeled.
38

39 PART 3--EXECUTION

40 FIELD QUALITY CONTROL:

41
42
43 One set of approved fire protection design drawings shall be maintained on the project site
44 during construction. The Subcontractor shall redline all changes daily. The redline drawings
45 shall be incorporated on the "as-built" design drawings by the Subcontractor.

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

**Document Type: Construction Specifications
SPC Number: 352, Revision 1**

Project Number: 021052

1 Materials: Only new and approved piping, fittings, hangers, and devices shall be employed
2 in the installation of the dry pipe system.
3

4 Installation: One set of approved fire protection layout drawings shall be maintained on the
5 project site during construction. The Subcontractor shall redline all changes daily. The
6 redline drawings shall be incorporated on the "as-built" layout drawings by the
7 Subcontractor.
8

9 Welding: Welding shall be done in accordance with NFPA 15. All weld areas shall be hot
10 dip galvanized to assure adequate corrosion protection. Spray or paint on galvanization will
11 not be acceptable to repair galvanization damaged by welding.
12

13 Acceptance Tests:
14

15 Test of Dry Pipe System Piping: All new fire system piping shall be hydrostatically
16 tested at not less than 225-psi pressure for two (2) hours with no visible leakage. All
17 leaks shall be repaired and system retested.
18

19 Dry System Air Test: In addition to the standard hydrostatic test, an air pressure
20 leakage test at 40 psi shall be conducted for 24 hours. Any leakage that results in a
21 loss of pressure in excess of 1½ psi for the 24 hours shall be corrected.
22

23 Compressor Test: Verify the air compressor starts and stops at the correct air
24 pressures for the dry pipe valve selected. Pressures must not exceed the maximum
25 pressure or go below the minimum pressure as recommended by the dry pipe valve
26 manufacture.
27

28 CLEANING:
29

30 Flushing of Piping Main: New underground mains and lead-in connections to system risers
31 shall be flushed thoroughly immediately after tie-in to system is made.
32

33 Pipe Flushing Procedure: Upon completion of installation, the system shall be filled and
34 drained at least two (2) times. Water shall be run through the end of the line until clear and
35 water discharged to an approved location.
36

37 Testing and flushing shall be witnessed by the Contractor's Representative. The test water
38 shall not be disposed of on the Pit 9 Surface. The test water may be disposed of in the Main
39 Channel Flow System (MCFS) in accordance with the Subcontractors approved disposal
40 plan. Scour and erosion of soils shall be prevented. Sedimentation will not be allowed in the
41 MCFS. There is a catch basin located in the southeast corner of Pit 9 that can be to contain
42 the flushing water. The disposal of the test water shall be coordinated with RWMC
43 operations. System shall be left in a drained condition.
44

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

**Document Type: Construction Specifications Project Number: 021052
SPC Number: 352, Revision 1**

1 Surveillance will be performed by the Contractor's Representative to verify compliance of
2 the work to the drawings and specifications.

3

4 END OF SECTION 13911

Attachment A

Contractor's Material & Test Certificate
for each
Dry Pipe Fire Protection System

CONTRACTOR'S MATERIAL AND TEST CERTIFICATE FOR ABOVEGROUND PIPING

PROCEDURE												
Upon completion of work, inspection and tests shall be made by the contractor's representative and witnessed by an owner's representative. All defects shall be corrected and system left in service before contractor's personnel finally leave the job.												
A certificate shall be filled out and signed by both representatives. Copies shall be prepared for approving authorities, owners, and contractor. It is understood the owner's representative's signature in no way prejudices any claim against contractor for faulty material, poor workmanship, or failure to comply with approving authority's requirements or local ordinances.												
Property Name										Date		
Property Address												
PLANS	Accepted by approving authorities (names)											
	Address											
	Installation conforms to accepted plans Equipment used is approved. If no, explain deviation										<input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> YES <input type="checkbox"/> NO	
INSTRUCTIONS	Has person in charge of fire equipment been instructed as to location of control valves and care and maintenance of this new equipment? If no, explain										<input type="checkbox"/> YES <input type="checkbox"/> NO	
	Have copies of the following been left on the premises: 1. System Components Instructions 2. Care and Maintenance Instructions 3. NFPA 25										<input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> YES <input type="checkbox"/> NO	
LOCATION OF SYSTEM	Supplies Buildings											
SPRINKLERS	Make	Model	Year of Manufacture	Orifice Size	Quantity	Temperature Rating						
PIPE AND FITTINGS	Type of Pipe Type of Fittings											
ALARM VALVE OR FLOW INDICATOR	Alarm Device										Maximum Time to Operate Through Test Connection	
	Type			Make			Model				Minutes	Seconds
DRY PIPE OPERATING TEST	Dry Valve						Q.O.D.					
	Make		Model		Serial No.		Make		Model		Serial No.	
			Time to Trip Thru Test Connection*		Water Pressure	Air Pressure	Trip Point Air Pressure	Time Water Reached Test Outlet*		Alarm Operated Properly		
			Min	Sec	psi	psi	psi	Min	Sec	Yes	No	
	Without Q.O.D.											
	With Q.O.D.											
If no, explain												
DELUGE & PREACTION VALVES	Operation <input type="checkbox"/> Pneumatic <input type="checkbox"/> Electric <input type="checkbox"/> Hydraulic											
	Piping Supervised <input type="checkbox"/> YES <input type="checkbox"/> NO						Detecting media supervised <input type="checkbox"/> YES <input type="checkbox"/> NO					
	Does valve operate from the manual trip and/or remote control stations <input type="checkbox"/> YES <input type="checkbox"/> NO											

*Measured from time inspector's test connection is opened.

DELUGE & PREACTION VALVES (continued)	Is there an accessible facility in each circuit for testing <input type="checkbox"/> YES <input type="checkbox"/> NO				If no, explain			
	Make	Model	Does Each Circuit Operate Supervision Loss Alarm		Does Each Circuit Operate Valve Release		Maximum Time to Operate Release	
			Yes	No	Yes	No	Min	Sec
PRESSURE REDUCING VALVE TEST	Location & Floor	Make & Model	Setting	Static Pressure		Residual Pressure (Flowing)		Flow Rate
TEST DESCRIPTION				Inlet (PSI)	Outlet (PSI)	Inlet (PSI)	Outlet (PSI)	Flow (GPM)
TEST DESCRIPTION	<p><u>Hydrostatic</u>: Hydrostatic test shall be made at not less than 200 psi (13.6 bars) for two hours or 50 psi (3.4 bars) above static pressure in excess of 150 psi (10.2 bars) for two hours. Differential dry-pipe valve clappers shall be left open during test to prevent damage. All aboveground piping leakage shall be stopped.</p> <p><u>Pneumatic</u>: Establish 40 psi (2.7 bars) air pressure and measure drop which shall not exceed 1-1/2 psi (0.1 bars) in 24 hours. Test pressure tanks at normal water level and air pressure and measure air pressure drop which shall not exceed 1-1/2 psi (0.1 bars) in 24 hours.</p>							
TESTS	All piping hydrostatically tested at ___ psi for ___ hrs. Dry piping pneumatically tested <input type="checkbox"/> YES <input type="checkbox"/> NO Equipment operates properly <input type="checkbox"/> YES <input type="checkbox"/> NO				If no, state reason			
	Do you certify as the Sprinkler Contractor that additives and corrosive chemicals, sodium silicate or derivatives of sodium silicate, brine, or other corrosive chemicals were not used for testing systems or stopping leaks? <input type="checkbox"/> YES <input type="checkbox"/> NO							
	Drain Test	Reading of gage located near water supply test connection: ___ psi			Residual pressure with valve in test connection open wide ___ psi.			
	Underground mains and lead in connections to system risers flushed before connection made to sprinkler piping. Verified by copy of the U Form No. 85B <input type="checkbox"/> YES <input type="checkbox"/> NO Other Explain Flushed by installer of underground sprinkler piping <input type="checkbox"/> YES <input type="checkbox"/> NO							
	If powder driven fasteners are used in concrete, <input type="checkbox"/> YES <input type="checkbox"/> NO has representative sample testing been satisfactorily completed							If no, explain
BLANK TESTING GASKETS	Number Used			Locations			Number Removed	
WELDING	Welded Piping <input type="checkbox"/> YES <input type="checkbox"/> NO				If Yes...			
	Do you certify as the Sprinkler Contractor that welding procedures comply with the requirements of at least AWS D10.9, Level AR-3						<input type="checkbox"/> YES	<input type="checkbox"/> NO
	Do you certify that the welding as performed by welders qualified in compliance with the requirements of at least AWS D10.9, Level AR-3						<input type="checkbox"/> YES	<input type="checkbox"/> NO
CUTOUTS (DISCS)	Do you certify that you have a control feature to ensure that all cutouts (discs) are retrieved? <input type="checkbox"/> YES <input type="checkbox"/> NO							
HYDRAULIC DATA NAMEPLATE	Name Plate Provided <input type="checkbox"/> YES <input type="checkbox"/> NO				If no, explain			
REMARKS	Date left in service with all control valves open:							
SIGNATURES	Name of Sprinkler contractor							
	Tests Witnessed By							
	For Property Owner (Signed)			Title			Date	
	For Sprinkler Contractor (Signed)			Title			Date	
Additional Explanation and Notes								

Project Title: OU7-10 Glovebox Excavator Method Project
Site Development
Document Type: Construction Specifications **Project Number: 021052**
SPC Number: 352, Revision 1

1 SECTION 13914--MANUAL DELUGE SYSTEMS (FIRE HYDRANT AND FUTURE
2 RCS)

3
4 PART 1--GENERAL

5
6 WORK INCLUDED: Work includes, but is not limited to:

7
8 Design, layout, fabricate, install, terminate, flush, and test a complete Manual Fire
9 Hydrant system. Include pipe, fittings, hose valves, hangers, supports, earthquake
10 bracing, expansion joints, control valve assemblies, and all necessary accessories and
11 components to assure a complete and operable system. The Subcontractor shall be
12 responsible for coordinating all existing and new work. The Subcontractor shall
13 install the new Manual Fire Hydrant system in a craftsman-like manner.

14
15 The project will include the installation of a pipe header up to and including the four
16 (4) isolation valves for the four (4) risers and connection to the underground water
17 supply in the Fire Riser Building that will have four pipe risers connected to it. The
18 Fire Riser Building will be provided by others. There will be two manual deluge
19 risers and two dry pipe risers that will have the system piping extended about 150 feet
20 to the west. The piping will be supported on pipe stands as shown on the drawings
21 and described in these specifications.

22
23 Install fire riser header (manifold) assembly to deluge fire hydrant, RCS monitor, dry
24 pipe fire protection systems in the WES and RCS, up to and including the isolation
25 valves at each connection.

26
27 RELATED SECTIONS:

- 28 Section 01300 Submittals
29 Section 13117 Temporary Fire Riser Building
30 Section 13505 Underground Fire Water Main
31 Section 13911 Dry Pipe Fire Protection Systems

32
33
34 REFERENCES:

35
36 The following documents, including others referenced therein, form part of this Section to
37 the extent designated herein.

38
39 NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

- 40
41 NFPA 13 Standard for the Installation of Sprinkler Systems
42 NFPA 14 Standard for the installation of Standpipe Systems

43
44

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

**Document Type: Construction Specifications Project Number: 021052
SPC Number: 352, Revision 1**

1 from the connection to the underground main, and all other piping, which is open to the
2 atmosphere shall be galvanized piping.

3
4 Seismic Bracing: Earthquake sway bracing shall be provided based upon FM 2-8 using a
5 "G" factor of 0.5. Calculations, using the zone of influence method, showing the forces on
6 the attachments shall be done to verify that the minimum requirements outlined are not
7 exceeding the allowable strengths of listed equipment or allowable strength of the building
8 structure at the point of attachment. Details of the sway bracing shall be provided on the
9 shop drawings and bracing calculation sheets.

10
11 The Subcontractor shall be responsible for coordinating with the building manufacture to
12 assure the structure is capable of supporting both the static and dynamic loads imposed by
13 the system layout. The forces developed at the point of connection to the structure must be
14 taken into account and approved by the building structural designer.

15
16 Control Valves: All valves controlling fire protection water supplies shall be provided with
17 electronic valve supervision capabilities.

18
19 Splash Blocks: The Subcontractor shall furnish splash blocks at the main drain and all other
20 exterior discharge locations that do not drain onto asphalt or concrete.

21
22 SUBMITTALS:

23
24 Layout: The dry pipe fire protection system layout shall be submitted as a complete bound
25 package for review and approval by the Contractor. A complete package shall include all
26 working plans, hydraulic calculations, sway bracing calculations, and other vendor data
27 required by this specification section.

28
29 Working plans shall contain all information required by NFPA 13 and include all piping,
30 offsets, fittings, hangers, lighting, and obstructions. Partial submittals will be considered as
31 incomplete and will not be reviewed. The layout must be reviewed and receive an
32 authorization to proceed by the Contractor prior to beginning of installation.

33
34 The Subcontractor shall submit all layout drawings for review and authorization to proceed
35 prior to construction. All drawings shall be CAD generated and completed on size D
36 (22 × 34 in.) drawings. Lettering size shall be a minimum of 1/8 (.125)" inch for all lettering
37 on the main body of the drawing. Border and title block shall follow format in this drawing
38 package. An electronic copy in AutoCAD 2000, DWG format, shall be furnished in addition
39 to the original drawing plots. Electronic copies of border and title block format is available
40 upon request. An A/E Drawing Standard format is available upon request.

41
42 As-built drawings in electronic form shall be submitted. Additionally, electronic As-built
43 hydraulic calculations, compatible with HASS 7.3 shall be submitted with the drawings.

Project Title: OU7-10 Glovebox Excavator Method Project
Site Development
Document Type: Construction Specifications **Project Number: 021052**
SPC Number: 352, Revision 1

1 Quality Control Submittals:
2

3 Subcontractor shall submit a detailed hydrostatic test procedure and a detailed
4 flushing procedure.
5

6 Procedures: The Subcontractor shall submit a detailed job specific flushing
7 procedure. The flushing procedure shall outline where the flushing water will be
8 obtained and how it will be disposed of in a safe manner. Test water shall not be
9 disposed of on the Pit 9 surface. The procedure shall also outline how the flow will be
10 monitored to assure adequate flow and how long the flow must be maintained to
11 adequately flush the piping. This procedure must be submitted for review prior to
12 any connections to existing plant piping.
13

14 Certifications: A Contractor's Material and Test Certification for Above-Ground
15 Piping shall be completed and accepted, for each of the manual deluge systems
16 covered by this specification prior to final acceptance of the installation. See
17 Attachment 'A'.
18

19 Test Reports: A final inspection form shall be submitted for the automatic sprinkler
20 system installed or modified by this project. See Attachment 2 of this section for
21 acceptance forms to be submitted.
22

23 Qualifications: Submit documentation showing the qualifications of the NICET
24 Certified Technician Level III for this project.
25

26 Manufacturer: Submit documentation showing the pipe manufacturer's products have
27 been in satisfactory service for five or more years.
28

29 Installer: Submit documentation showing the installation company for this project has
30 three or more years of successful installation experience. The installation company
31 shall also submit a photocopy of their State of Idaho license as a Fire Protection
32 Subcontractor.
33

34 Thrust Restraint: Submit thrust block or thrust restraint calculations and sketches.
35

36 See Section 01300, Submittals and the Vendor Data Schedule for additional submittal
37 requirements.
38

39 QUALITY CONTROL:
40

41 Qualifications: The Subcontractor for the manual deluge systems shall have a NICET
42 Certified Engineering Technician, (CET), in Fire Protection with a minimum Level III rating
43 responsible for overseeing the preparation of the layout drawings and installation. This
44 person shall be required to certify that the drawings are in accordance with this specification
45 and all referenced regulatory requirements. All drawings shall be signed by the CET.

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

**Document Type: Construction Specifications
SPC Number: 352, Revision 1**

Project Number: 021052

1 Manufacturers: Firms regularly engaged in the manufacture of fire protection equipment and
2 piping accessories of types and sizes required, whose products have been in satisfactory use
3 in similar service for not less than 5 yrs.
4

5 Installer: A firm with at least 3 yrs of successful installation experience on projects with fire
6 sprinkler piping similar to that required for this project. The installing subcontractor shall be
7 licensed, by the State of Idaho as a Fire Sprinkler Subcontractor.
8

9 Materials: Comply with the provisions of the following codes and standards unless
10 otherwise specified herein.
11

12 NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

13
14 NFPA 13 Standard for the Installation of Sprinkler Systems
15 NFPA 14 Standard for the Installation of Standpipe Systems
16

17 FACTORY MUTUAL (FM)

18
19 FM Approval Guide Fire Protection
20 FM Data Sheet 2-8 Earthquake Protection for Sprinkler Systems
21

22 Notification: The Subcontractor shall notify the Contractor in writing two weeks prior to
23 beginning work.
24

25 Workmanship: All work shall be done in a skillful and workmanlike manner. No
26 modifications or rearrangements, not shown on the drawings, shall be made without prior
27 approval from the Contractor.
28

29 Upon completion of the systems installation, the individual with the NICET level III shall
30 verify the installation has been installed in accordance with the working drawings and meets
31 the layout requirements of this specification.
32

33 DELIVERY, STORAGE AND HANDLING:
34

35 All materials shall be delivered to and stored at the job site in a manner which will prevent
36 foreign material from getting inside the piping and valving.
37

38 SEQUENCING /SCHEDULING:
39

40 The static and dynamic loads associated with the fire protection system must be coordinated
41 with the Fire Riser building structural design.
42
43

Project Title: OU7-10 Glovebox Excavator Method Project
Site Development
Document Type: Construction Specifications **Project Number: 021052**
SPC Number: 352, Revision 1

1 PART 2--PRODUCTS

2
3 MATERIALS AND EQUIPMENT:

4
5 NOTE: Not all products are listed in this specification section. For additional products see
6 drawings.

7
8 Piping: Piping shall be welded or seamless galvanized steel, Schedule 40, conforming to the
9 requirements set forth in NFPA 15. Thin wall and Schedule 10 piping is not acceptable.
10 Welding will not be allowed on galvanized piping unless the weld effect area is hot dip
11 galvanized after welding is completed.

12
13 Pipe Fittings: Fitting shall be hot dipped galvanized in accordance with the requirements set
14 forth in NFPA 15. Reduction in pipe size shall be made with one-piece reducing fittings.
15 Bushings will not be acceptable. Plain-end fittings are not acceptable.

16
17 Welded fittings on galvanized piping will not be allowed unless the weld effected zone of the
18 fitting and associated piping is hot dip galvanized.

19
20 Pipe Couplings: Flexible galvanized couplings in pipelines shall be UL listed or FM
21 approved and they shall be in conformance with NFPA 15 using Victaulic, Style 75. The
22 grooving machine used to prepare the piping to accept the flexible couplings shall be
23 approved for use with the coupling by the coupling manufacturer.

24
25 Rigid couplings in pipelines shall be Victaulic Style 005, 07. The grooving machine used to
26 prepare the piping to accept the rigid couplings shall be approved for use with the coupling
27 by the coupling manufacture.

28
29 Plain end and welded couplings shall not be allowed

30
31 Fire Department Connections: Shall be of the siamese type, 2½ x 2½ x 4 in. and shall have
32 two 2½ in. female swivel connections with National Standard fire hose threads. The fire
33 department connections shall be Potter-Roemer Model 5710. Two 2½ in. plugs shall be
34 included and shall be Potter-Roemer Model 5950. An identification plate labeled
35 "AUTOSPKR" shall be provided.

36
37 Riser Block Valves: Riser block valves shall be UL listed or FM approved valves. Each
38 valve shall include an approved position supervisory switch that can be connected normally
39 open or normally shut.

40
41 Butterfly Valve: A butterfly valve with weather proof actuator housing, have a
42 positive indication for the open and closed position, and be prewired for valve
43 supervision. It shall be Victaulic Series 708-W.

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

**Document Type: Construction Specifications
SPC Number: 352, Revision 1**

Project Number: 021052

1 Outside Screw and Yoke (OS&Y): Valves shall be UL listed and FM approved.
2 American Flow Control, Series 500.

3
4 Pipe Stands: Pipe stands shall be adjustable and have a pipe saddle. Tolco Fig. 319 with Fig.
5 317 saddle.

6
7 Check Valves: Wafer check valves shall contain an o-ring sealed clapper, torsion spring
8 loaded, and be of the butterfly valve type. Grinnell, Model F512.

9
10 Earthquake and Sway Bracing: Bracing shall be UL listed or designed by a registered
11 Professional Engineer in the State of Idaho. Bracing by TOLCO.

12
13 Signs: All drain and test valves shall have identification signs per NFPA 13. Lettering shall
14 be a minimum of ½ in. high white letters on red background.

15
16 Splash Block: Splash blocks shall be constructed of concrete.

17
18 EQUIPMENT AND DEVICE LABELS:

19
20 Labels shall be made upon red engraved laminated phenolic resin nameplates with white
21 lettering. Labels for equipment shall be permanently installed by gluing, chaining, or
22 screwing them to the equipment.

23
24 PAINTING AND IDENTIFICATION OF PIPING

25
26 See Section 09900 Painting, for the requirements of painting and labeling all pipe, fittings,
27 hangers, and devices. Galvanized or stainless steel piping need not be painted but shall be
28 labeled.

29
30 PART 3--EXECUTION

31
32 FIELD QUALITY CONTROL:

33
34 One set of approved fire protection design drawings shall be maintained on the project site
35 during construction. The Subcontractor shall redline all changes daily. The redline drawings
36 shall be incorporated on the "as-built" design drawings by the Subcontractor.

37
38 Materials: Only new and approved piping, fittings, hangers, and devices shall be employed
39 in the installation of these system.

40
41 Installation: One set of approved fire protection layout drawings shall be maintained on the
42 project site during construction. The Subcontractor shall redline all changes daily. The
43 redline drawings shall be incorporated on the "as-built" layout drawings by the
44 Subcontractor.

45

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

**Document Type: Construction Specifications Project Number: 021052
SPC Number: 352, Revision 1**

1 Stainless steel screwed fittings shall utilize TEFLON tape and /or TEFLON paste to prevent
2 galling.

3
4 Welding: Welding shall be done in accordance with NFPA 15. All weld areas shall be hot
5 dip galvanized to assure adequate corrosion protection. Spray or paint on galvanization will
6 not be acceptable to repair galvanization damaged by welding.

7
8 Acceptance Tests:

9
10 Manual Deluge Systems Piping: All new fire system piping shall be hydrostatically
11 tested at not less 225-psi pressure for two (2) hours with no visible leakage following
12 an approved procedure. Reference NFPA 13. The procedure shall be provided as
13 outlined in the Vendor Data. All leaks shall be repaired and system retested.
14 Reference NFPA 13. Testing and flushing shall be witnessed by the Contractor's
15 Representative. The test water shall not be disposed of on the Pit 9 Surface. The test
16 water may be disposed of in the Main Channel Flow System (MCFS) in accordance
17 with the Subcontractors approved disposal plan. Scour and erosion of soils shall be
18 prevented. Sedimentation will not be allowed in the MCFS. There is a catch basin
19 located in the southeast corner of Pit 9 that can be to contain the flushing water. The
20 disposal of the test water shall be coordinated with RWMC operations.

21
22 CLEANING:

23
24 Flushing of Piping Main: New underground mains and lead-in connections to system risers
25 shall be flushed thoroughly immediately after tie-in to system is made.

26
27 Pipe Flushing Procedure: Upon completion of sterilization, the system shall be filled and
28 drained at least two (2) times. Water shall be run through the end of the line until clear and
29 water discharged to an approved location. Testing and flushing shall be witnessed by the
30 Contractor's Representative. The test water shall not be disposed of on the Pit 9 Surface. The
31 test water may be disposed of in the Main Channel Flow System (MCFS) in accordance with
32 the Subcontractors approved disposal plan. Scour and erosion of soils shall be prevented.
33 Sedimentation will not be allowed in the MCFS. The disposal of the test water shall be
34 coordinated with RWMC operations. System shall be left in a drained condition.

35
36 Surveillance will be performed by the Contractor's Representative to verify compliance of
37 the work to the drawings and specifications.

38
39 END OF SECTION 13914

Attachment A

Contractor's Material & Test Certificate
for
Manual Deluge systems
(Fire Hydrant and Future RCS)

CONTRACTOR'S MATERIAL AND TEST CERTIFICATE FOR ABOVEGROUND PIPING

PROCEDURE											
Upon completion of work, inspection and tests shall be made by the contractor's representative and witnessed by an owner's representative. All defects shall be corrected and system left in service before contractor's personnel finally leave the job.											
A certificate shall be filled out and signed by both representatives. Copies shall be prepared for approving authorities, owners, and contractor. It is understood the owner's representative's signature in no way prejudices any claim against contractor for faulty material, poor workmanship, or failure to comply with approving authority's requirements or local ordinances.											
Property Name								Date			
Property Address											
PLANS	Accepted by approving authorities (names)										
	Address										
	Installation conforms to accepted plans Equipment used is approved. If no, explain deviation								<input type="checkbox"/> YES	<input type="checkbox"/> NO	
INSTRUCTIONS	Has person in charge of fire equipment been instructed as to location of control valves and care and maintenance of this new equipment? If no, explain								<input type="checkbox"/> YES	<input type="checkbox"/> NO	
	Have copies of the following been left on the premises: 1. System Components Instructions 2. Care and Maintenance Instructions 3. NFPA 25								<input type="checkbox"/> YES	<input type="checkbox"/> NO	
LOCATION OF SYSTEM Supplies Buildings											
SPRINKLERS	Make	Model			Year of Manufacture		Orifice Size	Quantity	Temperature Rating		
PIPE AND FITTINGS Type of Pipe Type of Fittings											
ALARM VALVE OR FLOW INDICATOR	Alarm Device								Maximum Time to Operate Through Test Connection		
	Type			Make			Model		Minutes	Seconds	
DRY PIPE OPERATING TEST	Dry Valve					Q.O.D.					
	Make		Model		Serial No.		Make		Model		Serial No.
If no, explain											
DELUGE & PREACTION VALVES											
Operation <input type="checkbox"/> Pneumatic <input type="checkbox"/> Electric <input type="checkbox"/> Hydraulic											
Piping Supervised <input type="checkbox"/> YES <input type="checkbox"/> NO						Detecting med a supervised <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO					
Does valve operate from the manual trip and/or remote control stations <input type="checkbox"/> YES <input type="checkbox"/> NO											

*Measured from time inspector's test connection is opened.

DELUGE & PREACTION VALVES (continued)	Is there an accessible facility in each circuit for testing <input type="checkbox"/> YES <input type="checkbox"/> NO				If no, explain			
	Make	Model	Does Each Circuit Operate Supervision Loss Alarm		Does Each Circuit Operate Valve Release		Maximum Time to Operate Release	
			Yes	No	Yes	No	Min	Sec
PRESSURE REDUCING VALVE TEST	Location & Floor	Make & Model	Setting	Static Pressure		Residual Pressure (Flowing)		Flow Rate
				Inlet (PSI)	Outlet (PSI)	Inlet (PSI)	Outlet (PSI)	Flow (GPM)
TEST DESCRIPTION	<p><u>Hydrostatic</u>: Hydrostatic test shall be made at not less than 200 psi (13.6 bars) for two hours or 50 psi (3.4 bars) above static pressure in excess of 150 psi (10.2 bars) for two hours. Differential dry-pipe valve clappers shall be left open during test to prevent damage. All above-ground piping leakage shall be stopped.</p> <p><u>Pneumatic</u>: Establish 40 psi (2.7 bars) air pressure and measure drop which shall not exceed 1-1/2 psi (0.1 bars) in 24 hours. Test pressure tanks at normal water level and air pressure and measure air pressure drop which shall not exceed 1-1/2 psi (0.1 bars) in 24 hours.</p>							
TESTS	All piping hydrostatically tested at ___ psi for ___ hrs. Dry piping pneumatically tested <input type="checkbox"/> YES <input type="checkbox"/> NO Equipment operates properly <input type="checkbox"/> YES <input type="checkbox"/> NO				If no, state reason			
	Do you certify as the Sprinkler Contractor that additives and corrosive chemicals, sodium silicate or derivatives of sodium silicate, brine, or other corrosive chemicals were not used for testing systems or stopping leaks? <input type="checkbox"/> YES <input type="checkbox"/> NO							
	Drain Test	Reading of gage located near water supply test connection: ___ psi			Residual pressure with valve in test connection open wide ___ psi.			
	Underground mains and lead in connections to system risers flushed before connection made to sprinkler piping. Verified by copy of the U Form No. 85B <input type="checkbox"/> YES <input type="checkbox"/> NO Other Explain							
	Flushed by installer of underground sprinkler piping <input type="checkbox"/> YES <input type="checkbox"/> NO							Explain
If powder driven fasteners are used in concrete, <input type="checkbox"/> YES <input type="checkbox"/> NO has representative sample testing been satisfactorily completed							If no, explain	
BLANK TESTING GASKETS	Number Used			Locations			Number Removed	
WELDING	Welded Piping <input type="checkbox"/> YES <input type="checkbox"/> NO							
	If Yes...							
	Do you certify as the Sprinkler Contractor that welding procedures comply with the requirements of at least AWS D10.9, Level AR-3						<input type="checkbox"/> YES	<input type="checkbox"/> NO
	Do you certify that the welding as performed by welders qualified in compliance with the requirements of at least AWS D10.9, Level AR-3						<input type="checkbox"/> YES	<input type="checkbox"/> NO
Do you certify that welding was carried out in compliance with a documented quality control procedure to ensure that all discs are retrieved, that openings in piping are smooth, that slag and other welding residue are removed, and that the internal diameters of piping are not penetrated						<input type="checkbox"/> YES	<input type="checkbox"/> NO	
CUTOUTS (DISCS)	Do you certify that you have a control feature to ensure that all cutouts (discs) are retrieved? <input type="checkbox"/> YES <input type="checkbox"/> NO							
HYDRAULIC DATA NAMEPLATE	Name Plate Provided <input type="checkbox"/> YES <input type="checkbox"/> NO				If no, explain			
REMARKS	Date left in service with all control valves open:							
SIGNATURES	Name of Sprinkler contractor							
	Tests Witnessed By							
	For Property Owner (Signed)			Title			Date	
	For Sprinkler Contractor (Signed)			Title			Date	
Additional Explanation and Notes								

Project Title: OU7-10 Glovebox Excavator Method Project
Site Development
Document Type: Construction Specifications **Project Number: 021052**
SPC Number: 352, Revision 1

1 SECTION 16000--ELECTRICAL GENERAL PROVISIONS

2
3 PART 1--GENERAL

4
5 SUMMARY:

6
7 The Subcontractor shall provide, install, terminate, and test all the systems as described in the
8 specification and shown on the drawings to make complete and operational electrical
9 systems.

10
11 Section Includes, but is not limited to:

12
13 Power distribution including transformers, feeders, and safety switches.

14
15 Normal and standby power distribution including controls and grounding.

16
17 Related Sections:

18
19 02200 Earthwork

20 03300 Cast-In-Place Concrete (concrete slab grounding system)

21
22 REFERENCES:

23
24 The following documents, including others referenced therein, form part of this section to the
25 extent designated herein. Unless otherwise indicated, use the latest edition in effect as of the
26 date of these specifications.

27
28 AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

29
30 ANSI C-2 National Electrical Safety Code (NESC)

31
32 NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

33
34 NFPA-70 National Electrical Code (NEC)

35 NFPA-101 Life Safety Code

36
37 CODE OF FEDERAL REGULATIONS (CFR)

38
39 29 CFR 1910 Subpart S OSHA Electrical Safety

40
41 FACTORY MUTUAL

42
43 NATIONAL RECOGNIZED TESTING LABORATORIES (NRTL)

Project Title: OU7-10 Glovebox Excavator Method Project
Site Development
Document Type: Construction Specifications **Project Number:** 021052
SPC Number: 352, Revision 1

1 NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

2
3 INTERNATIONAL ELECTRICAL TESTING ASSOCIATION (NETA)

4
5 CANADIAN STANDARDS ASSOCIATION (CSA)

6
7 UNDERWRITERS' LABORATORIES, INC. (UL)

8
9 UL 486A Wire Connectors and Soldering Lugs for Use with Copper
10 Conductors

11
12 SUBMITTALS:

13
14 See Section 01300, Submittals, other electrical sections and the Vendor Data Schedule for
15 submittal requirements.

16
17 QUALITY CONTROL:

18
19 Underwriters Laboratories (UL): All materials, appliances, equipment or devices shall
20 conform to the applicable standards of Underwriters Laboratories, Inc. All material,
21 appliances, equipment or devices shall be listed and/or labeled by UL or other nationally
22 recognized testing laboratories such as the CSA.

23
24 Completed electrical system shall conform with applicable provisions of the Special
25 Conditions, the Technical Specification, and the subcontract drawings.

26
27 PART 2--PRODUCTS

28
29 GENERAL:

30
31 Furnish all labor, materials, equipment and appliances required to complete the installation of
32 the complete electrical systems. All labor, materials, service, equipment, and workmanship
33 shall conform to the applicable chapters of the National Electrical Code (NEC), the National
34 Electrical Safety Code (NESC) and Occupational Safety and Health Administration (OSHA).
35 All modifications required by these codes, rules, regulations, and authorities shall be made by
36 the Subcontractor without additional charge to the Contractor.

37
38 MANUFACTURERS:

39
40 Where multiple units of a product are required for the electrical work, provide identical
41 products by the same manufacturer without variations except for sizes and similar variations
42 as indicated.

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

**Document Type: Construction Specifications
SPC Number: 352, Revision 1**

Project Number: 021052

1 MATERIALS:

2

3 Except as otherwise indicated, furnish new electrical products, free of defects and harmful
4 deterioration at the time of installation. Provide each product complete with trim,
5 accessories, finish, guards, safety devices and similar components specified or recognized as
6 integral parts of the product, or required by governing regulations.

7

8 Unless otherwise indicated by the drawings or specifications or approved in writing, the
9 materials and/or equipment furnished under these specifications shall be the standard
10 products of manufacturers regularly engaged in the production of such equipment, and shall
11 be the manufacturer's standard design.

12

13 ENVIRONMENTAL CONDITIONS:

14

15 Climatic and Geographic Site Conditions

16

17	Site Elevation	4,917 feet
18	Barometric Pressure	12.27 psia
19	Relative Humidity	90% max. at 30°F (-1.1°C) dry bulb
20		15% min. at 60°F (+15.5°C) dry bulb
21	Uniform Building Code	Seismic Zone 2B
22	Temperature	+104°F (+40°C) max.
23		-40°F (-40°C) min.
24	Snow Load	30 psf
25	Wind Forces	80 mph Exposure Class "C"

26

27 NEMA 3R enclosures will be provided for all outdoor equipment.

28

29 Labeling: Install permanent labels on all electrical equipment.

30

31 PART 3--EXECUTION

32

33 SEQUENCING/SCHEDULING:

34

35 General: It is recognized that the subcontract documents are diagrammatic in showing
36 certain physical relationships which must be established within the electrical work and in its
37 interface with other work, including utilities and mechanical work, and that such
38 establishment is the exclusive responsibility of the Subcontractor.

39

40 Locate operating and control equipment properly to provide easy access, and working
41 clearance in accordance with the NEC.

42

43 Advise other trades of openings or clearances required in their work for the subsequent
44 move-in and assembly of large units of electrical equipment.

45

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

Document Type: Construction Specifications Project Number: 021052
SPC Number: 352, Revision 1

1 Electrical connections shall be tightened to torque specifications stated by the equipment
2 manufacturer. If manufacturer has no recommended torque value, tighten as per UL 486A.

3
4 FIELD QUALITY CONTROL:

5
6 Subcontractor Supplied Testing: Upon completing installation of all systems and equipment,
7 but prior to project close out, the Subcontractor shall conduct an operational test of all
8 equipment, controls and devices installed or modified by the Subcontractor. The operational
9 test shall include performance tests required by the NEC. All equipment shall test
10 satisfactory or be repaired or replaced at no additional cost to the Contractor.

11
12 The Subcontractor shall test all devices in the presence of the Contractor's Representative.
13 Subcontractor shall coordinate testing with the Contractor and schedule testing a minimum of
14 2 weeks in advance of the test. The Subcontractor shall inform the Contractor in writing of
15 the scheduled test to allow the Contractor to designate the Contractor's Representative. This
16 operational testing is in addition to testing required in separate sections of this specification.

17
18 Contractor Inspection: Surveillance will be performed by the Contractor's Representative to
19 verify compliance of the work to the drawings and specifications.

20
21 END OF SECTION 16000

Project Title: OU7-10 Glovebox Excavator Method Project
Site Development
Document Type: Construction Specifications **Project Number: 021052**
SPC Number: 352, Revision 1

1 SECTION 16110--ELECTRICAL RACEWAYS

2
3 PART 1--GENERAL

4
5 SUMMARY:

6
7 The Subcontractor shall provide and install electrical raceways as shown on the drawings.

8
9 Section Includes, but is not limited to:

10
11 Provide and install electrical raceways of types, grades, and sizes specified on the
12 drawings.

13
14 Provide complete assembly of raceway including, but not necessarily limited to,
15 couplings, elbows, adapters, hold-down straps, and other components and accessories
16 as needed for a complete system.

17
18 Coordinate as necessary to integrate installation of electrical raceways and
19 components with other work.

20
21 Related Sections:

22
23 02200 Earthwork
24 16000 Electrical Sections

25
26 REFERENCES:

27
28 The following documents, including others referenced therein, form part of this Section to
29 the extent designated herein. See the list of general electrical references in Section 16000.

30
31 AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

32
33 ASME B1.20.1 Pipe Threads, General Purpose (Inch)

34
35 METAL FRAMING MANUFACTURER ASSOCIATION (MFMA)

36
37 MFMA-1 Metal Framing Channel

38
39 SUBMITTALS:

40
41 Vendor data is NOT required for this section.

42
43

Project Title: OU7-10 Glovebox Excavator Method Project

Site Development

Document Type: Construction Specifications

Project Number: 021052

SPC Number: 352, Revision 1

1 PART 2--PRODUCTS

2
3 MATERIALS:

4
5 Conduit:

6
7 Metal Conduit: Rigid metal (RGS) conduit or Intermediate Metal Conduit (IMC)
8 shall be used for all conductors buried in earth, in masonry, in concrete, and in damp
9 or wet locations. All conduit shall be UL approved, 3/4-in. minimum unless shown
10 otherwise on the drawings.

11
12 Flexible Conduit: Flexible metal conduit shall be installed in dry locations unless
13 shown otherwise on the drawings. Liquid-tight, flexible conduit shall be installed in
14 wet locations. Liquid-tight flex shall be grounding-type with a PVC jacket.

15
16 Fittings: Conduit fittings for rigid conduit (RGS or IMC) shall be rust-resistant cast steel.

17
18 Junction Boxes: All junction boxes shall be rated for wet locations. Enclosures larger than
19 12" x 12" shall be supported at each corner.

20
21 Framing Channel for Conduit/Box Support: Where indicated on the drawings or as required
22 by the NEC, bolted framing channel shall be used to support conduits and electrical boxes.
23 Galvanized steel channel shall be used in all outdoor/exterior locations. The minimum size
24 bolt used for bolting framing channel together for a support structure shall be 3/8". The
25 exposed ends of all framing channel shall have a protective cap installed. All framing
26 channels shall be made of channel, fittings, and hardware as defined in MFMA-1 and shall be
27 minimum 14-gauge steel.

28
29 Duct Sealing Compound: Non-hardening, safe for human skin contact, NOT deleterious to
30 cable insulation, workable at temperatures as low as 35°F (1°C), withstands temperature of
31 300°F (149°C) without slump, and adheres to clean surfaces of plastic ducts, metallic
32 conduits, conduit coatings, concrete, masonry, lead, cable sheaths, cable jackets, insulation
33 materials, and the common metals.

34
35 PART 3--EXECUTION

36
37 INSTALLATION:

38
39 Install and support conduit in accordance with applicable requirements of NEC, and National
40 Electrical Contractors Association's "Standard of Installation". Comply with recognized
41 industry practices to ensure that products serve intended functions.

42
43 Where mounting channel is used, all exposed ends shall be capped. All above grade, exposed
44 conduit shall be anchored to mounting channels a minimum of 12 inches long.

45

Project Title: OU7-10 Glovebox Excavator Method Project

Site Development

Document Type: Construction Specifications

Project Number: 021052

SPC Number: 352, Revision 1

1 Provide liquid-tight flexible conduit for connection of motors and for other electrical
2 equipment where subject to movement or vibration, and also where subjected to one or more
3 of the following conditions:

- 4
- 5 1. Exterior locations
 - 6 2. Moist or humid atmospheres where condensation can be expected to
7 accumulate.
- 8

9 Rigid conduit (RGS and IMC) joints shall be cut square, reamed smooth in accordance with
10 the NEC requirements. Joints shall be threaded and drawn up wrench tight in accordance
11 with ASME B1.20.1. Bends or offsets shall be made with standard conduit bending dies that
12 will NOT injure or flatten the pipe.

13

14 Rigid conduit terminating at cabinets and boxes shall be rigidly secured with hobs on the
15 outside and locknuts and bushings on the inside.

16

17 Male threads on exterior runs of galvanized steel conduits shall be thoroughly coated with a
18 conducting sealing media such as petroleum base products. No red lead shall be used on any
19 conduit joint.

20

21 All conduit penetrations through building walls, fire walls, or floors shall be sealed around
22 outside of conduits with sealant appropriate for wall material (i.e., grout for concrete walls,
23 fire stop caulk for drywall, etc.). Conduit penetrating exterior walls shall be internally
24 weather sealed. Conduits 2 in. or greater, passing through fire floors, shall have UL or FM
25 approved internal fire seals.

26

27 All raceways entering service entrance equipment, switchgear or motor control centers from
28 service conduit, cable tray, or wire ways shall be sealed using fire-rated material. The seal
29 shall be installed at the exterior entrance to prevent animal entrance into the raceway system.

30

31 FIELD QUALITY CONTROL TESTING:

32

33 Subcontractor Inspection and Testing: The Subcontractor or his agents shall perform visual
34 inspections to determine that equipment installation conforms to the NEC, these
35 specifications, and the drawings.

36

37 Contractor Inspection: Surveillance will be performed by the Contractor's Representative to
38 verify compliance of the work with the drawings and specifications.

39

40 END OF SECTION 16110

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

**Document Type: Construction Specifications Project Number: 021052
SPC Number: 352, Revision 1**

1 SECTION 16120--CABLE, WIRE, CONNECTORS AND MISCELLANEOUS DEVICES

2
3 PART 1--GENERAL

4
5 SUMMARY:

6
7 The Subcontractor shall furnish, install, and terminate all cables, conductors, and devices to
8 make complete and operational systems for this project.

9
10 Section Includes, but is NOT limited to the following:

11
12 Provide and install cables, wires, and wiring connectors of sizes, ratings, materials
13 and types as specified on the drawings.

14
15 Related Sections: See other related sections for specific cables, wire, labels, and testing
16 requirements.

17
18 16000 Electrical General Provisions

19
20 REFERENCES:

21
22 The following documents, including others referenced therein, form part of this specification
23 to the extent designated. Unless otherwise indicated, use the latest edition in effect as of the
24 date of this specification.

25
26 INSTITUTE OF ELECTRICAL & ELECTRONICS ENGINEERS INC. (IEEE)

27
28 IEEE 576 Recommended Practice for Installation, Termination, and
29 Testing of Insulated Power Cables as Used in the Petroleum
30 and Chemical Industry

31 IEEE 1202 Standard for Flame Testing of Cables for Use in Cable Tray in
32 Industrial and Commercial Occupancies

33
34 NATIONAL ELECTRICAL CABLE ASSOCIATION (NECA)

35
36 Standard for Installation Practices

37
38 NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

39
40 NFPA 79 Electrical Standard for Industrial Machinery

41
42 UNDERWRITERS LABORATORIES, INC. (UL)

43
44 UL 1277 Electrical Power and Control Tray Cables with Optional
45 Optical Fiber Members

Project Title: OU7-10 Glovebox Excavator Method Project

Site Development

Document Type: Construction Specifications

Project Number: 021052

SPC Number: 352, Revision 1

1 UL 1581 Electrical Wires, Cables, and Flexible Cords

2

3 SUBMITTALS:

4

5 Submittals include, but are not limited to the following:

6

7 Megger test procedure and test results

8

9 See Section 01300, Submittals and the Vendor Data Schedule, for additional submittal
10 requirements.

11

12 PART 2--PRODUCTS

13

14 WIRING MATERIALS, 600 V:

15

16 Conductors shall be stranded for all sizes of wire and cable larger than 10 AWG.

17

18 Conductors shall be copper for all sizes.

19

20 Wire insulation shall be Type THHN/THWN or XHHW for all 600 V conductors unless
21 otherwise noted.

22

23 Minimum size of power conductors shall be No. 12.

24

25 Wiring shall be color-coded as indicated in the table below:

26

Conductor Code Color

Conductor	208/120 Volts*	480/277 Volts	240/120 Volts*
Phase A	Black	Yellow	Black
Phase B	Red	Orange	Red
Phase C	Blue	Brown	
Neutral	White	Gray	White
Ground	Green	Green	Green

27

28 * For new circuits installed in existing panels only, black may be used for any phase
29 conductor, white for neutral and green for ground.

30

31 Use appropriate colors of plastic tape or sleeves to identify conductors larger than #10 AWG
32 NOT furnished with colored insulation. Yellow phase tape shall consist of two separate
33 bands at each application point to avoid confusion with white, gray, or orange after aging. All
34 wire markers and phase tape shall be covered by clear heat-shrink sleeving.

35

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

**Document Type: Construction Specifications Project Number: 021052
SPC Number: 352, Revision 1**

1 Wire #10 AWG and smaller shall be furnished with continuous colored insulation for all
2 power, neutral and ground conductors when multiple circuits are installed to identify the
3 phase connected to, neutral, or equipment ground wiring. Bare copper conductors shall only
4 be used for ground conductors as shown on the drawings.

5
6 All flexible cables shall be listed for portable use and extra hard usage.

7
8 CONNECTORS:

9
10 All connections shall be tightened to the manufacturer's published torque values. Where
11 manufacturer does not specify torque requirements, connections shall be torqued to values
12 specified in UL 486A.

13
14 Connectors shall only be used as specified by manufacturer.

15
16 Spring type pressure connectors, such as "Scotchlock," shall be used for splicing No. 8 AWG
17 and smaller.

18
19 Splitbolt and/or lug type connectors such as "Burndy" shall be used for splicing No. 6 AWG
20 and larger.

21
22 Scotch mastic pads (or approved equal) and two layers of half wrapped electrical tape shall
23 be installed over all splitbolt connectors.

24
25 Where underground splices are made to repair damaged power cables, Scotchcast Power
26 Cable Splice Ket #82-A series or approved equal shall be used.

27
28 Crimp on spade or ring-tongue lug connectors shall be used for connection to terminal boards
29 such as "Stakon."

30
31 CIRCUIT BREAKER:

32
33 The existing load center in Building WMF-657 is a Square D, Type "QO" Load Center, a
34 single phase, 120/240 Vac. Provide a 50 ampere 2 pole circuit to provide service to the Fire
35 Water Riser building.

36
37

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

**Document Type: Construction Specifications
SPC Number: 352, Revision 1**

Project Number: 021052

1 PART 3--EXECUTION

2

3 INSTALLATION:

4

5 General: Install electrical cable, wire, and connectors as follows:

6

- 7 1. As specified on the drawings
8 2. As specified in manufacturer's written instructions
9 3. As specified in applicable requirements of NEC and NECA's "Standard of
10 Installation"
11 4. In accordance with recognized industry practices to ensure products serve
12 their intended functions.

13

14 Coordinate cable and wire installation work with electrical raceway and equipment
15 installation work as necessary for proper interface.

16

17 Bundle and form wires inside wireways, panel boards, control panels, junction boxes, etc. to
18 clear pinch points, hinges, screws and clamps associated with the enclosure cover.

19

20 Pull conductors at the same time if more than one is being installed in a raceway.

21

22 Use pulling compound or lubricant where necessary (compound must NOT cause the
23 conductor or insulation to deteriorate.)

24

25 Use pulling methods including fish tape, cable, or rope that cannot damage raceway.

26

27 Keep conductor splices to a minimum.

28

29 Install splices and taps that have a mechanical strength and insulation rating equivalent to, or
30 better than, the conductor.

31

32 Use splice and tap connectors that are compatible with conductor material.

33

34 FIELD QUALITY CONTROL:

35

36 Subcontractor Supplied Testing:

37

38 Meggering: Prior to terminating, test any cable or wire 25 ft. or more in length for
39 insulation resistance using the megger (500 V megger for 300 V insulation and
40 1000 V megger for 600 V insulation). Any wire identified with less than 10 megohms
41 to ground or other conductors shall be replaced before proceeding with the
42 terminating process. List the tested conductors on the required Test Data Submittal
43 Sheet. An alternate megger test voltage can be used as recommended by the
44 manufacturer for the specific cable or wiring.

45

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

**Document Type: Construction Specifications Project Number: 021052
SPC Number: 352, Revision 1**

- 1 Contractor Supplied Inspection and Testing: The Contractor's Representative shall witness
- 2 the installation of any cables installed via the "pull by" method.
- 3
- 4 Wire and cables shall be checked for proper termination and termination tightness. The
- 5 Contractor's Representative shall witness torquing of all connections unless indicated
- 6 otherwise.
- 7
- 8 Surveillance will be performed by the Contractor's Representative to verify compliance of
- 9 the work to the drawings and specifications.
- 10
- 11 END OF SECTION 16120

Project Title: OU7-10 Glovebox Excavator Method Project
Site Development
Document Type: Construction Specifications **Project Number:** 021052
SPC Number: 352, Revision 1

1 SECTION 16124--INSULATED MEDIUM VOLTAGE CABLE, AND CONNECTORS

2
3 PART 1--GENERAL

4
5 SUMMARY

6
7 This section includes multiple conductor cables, cable splices, terminations and accessories
8 for medium voltage cables.

9
10 Section Includes, but is not limited to:

11
12 Provide and install 15 kV cable and connectors of the types specified herein and as
13 shown on the drawings.

14
15 Install GFE 15kV cable as shown on the drawings. Provide and install new
16 connectors

17
18 Related Sections:

19
20 16000 Electrical General Provisions

21 16110 Electrical Raceways

22
23 REFERENCES:

24
25 The following documents, including others referenced therein, form part of this Section to
26 the extent designated herein. Unless otherwise indicated use the latest edition in effect as of
27 the date of these specifications.

28
29 INSTITUTE OF ELECTRICAL & ELECTRONICS ENGINEERS INC. (IEEE)

30
31 IEEE 48 IEEE Standard Test Procedures and Requirements for High-
32 Voltage Alternating Current Cable Terminations.
33 IEEE 386 Separable Insulated Connectors for Power Distribution Systems
34 above 600V.
35 IEEE 400 Guide for Making High-Direct-Voltage Tests on Power Cable
36 Systems in the Field.
37 IEEE 404 Standard for Power Cable Joints.
38 IEEE 592 Standard for Exposed Semiconducting Shields on Premolded
39 High-Voltage Cable Joints and Separable Insulated Connectors.

40
41 UNDERWRITERS LABORATORIES (UL)

42
43 UL 486A Wire Connectors and Soldering Lugs for Use with Copper
44 Conductors.
45 UL 1072 Medium Voltage Power Cables.

Project Title: OU7-10 Glovebox Excavator Method Project
Site Development
Document Type: Construction Specifications **Project Number:** 021052
SPC Number: 352, Revision 1

1 NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

2

3 NEMA WC26 Wire and Cable Packaging Standard

4

5 SUBMITTALS:

6

7 See Section 01300, Submittals and the Vendor Data Schedule for additional submittal
8 requirements.

9

10 QUALITY CONTROL:

11

12 Regulatory Requirements (Codes and Standards): Comply with provisions of the following
13 codes and standards unless otherwise specified herein.

14

15 NFPA 70, National Electrical Code

16 National Electrical Safety Code

17

18 Cables and connectors shall each be listed and labeled by UL.

19

20 Single Source Responsibility: All medium voltage cable shall be the product of a single
21 manufacturer.

22

23 Installer Qualifications: Engage an experienced Installer of medium-voltage electrical cable
24 to perform the installation specified in this section. In addition, for the specific work of cable
25 terminating, engage Installers who are experienced in cable terminations for the specific
26 types of cable and cable accessories specified in this Section.

27

28 Tester Qualifications: Engage a cable tester currently certified by NETA or National
29 Institute for Certification in Engineering Technologies to supervise on site testing.

30

31 DELIVERY, STORAGE, AND HANDLING:

32

33 Deliver medium-voltage cable on factory reels conforming to NEMA WC26. Store cable
34 reels on an elevated platform in a dry location. Cable ends shall be checked for water tight
35 seals. Reel ends of cables shall be immediately resealed after cutting to eliminate intrusion
36 of moisture. Cable jackets subject to ultra-violet degradation shall be stored indoors.

37

38

Project Title: OU7-10 Glovebox Excavator Method Project
Site Development
Document Type: Construction Specifications **Project Number:** 021052
SPC Number: 352, Revision 1

1 PART 2--PRODUCTS

2
3 MATERIALS:

4
5 MEDIUM-VOLTAGE CABLE:

6
7 General: Cable shall be multi conductor type, with types and size as indicated on the
8 drawings, and conforming to UL Standard 1072. Approved cable manufacturers are; Okonite
9 Co., Rome Cable Co., And Brand-Rex Cable Systems (Brintec Corp.).

10
11 Cable Type MV-90: Cable Type MV-90 shall be XLP insulated.

12
13 Conductors: Class B stranded, annealed copper.

14
15 Cable Jacket: Polyvinyl Chloride.

16
17 Metallic Shielding: Copper shielding tape, helically applied over semiconducting insulating
18 shield.

19
20 Cable Voltage Ratings: 15 kV phase-to-phase as shown on the drawings and in accordance
21 with the referenced standard.

22
23 Three-Conductor Cable Assembly: Three insulated, 15 kV shielded conductors as shown on
24 the drawings. The conductors shall be cabled together with grounding conductor(s), sized as
25 indicated, with fillers to make round, and secured with an overall PVC jacket.

26
27 Circuit Identification: Color-coded tape (Black-Phase A, Red-Phase B, Blue-Phase C) shall
28 be applied under the metallic shielding for 15 KV multi conductor cable.

29
30 SPLICING AND TERMINATING PRODUCTS:

31
32 General: Comply with IEEE 48, IEEE 400, IEEE 404, IEEE 592, and UL 486A.

33
34 Types: Compatible with the cable materials.

35
36 Terminating Kits: As recommended by the manufacturer in writing for the specific sizes,
37 ratings, configurations of cable conductor and terminations specified. Kits shall contain all
38 components required for a complete termination including detailed instructions and shall
39 provide insulation equivalent to the insulation class of the cable it connects. Terminations
40 shall be of the following manufactures: Thomas and Betts, Raychem heat shrink, or
41 approved equal.

42
43 Conductor Terminations, General: Comply with Class 1 of IEEE Standard 48. Insulation
44 class shall be equivalent to that of the cable upon which they are installed. Terminations for

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

Document Type: Construction Specifications

Project Number: 021052

SPC Number: 352, Revision 1

1 shielded cables shall include a shield grounding strap. Termination kits shall be performance
2 tested for compliance with IEEE Standard 48 and shall be of the following types:

3
4 Class 1 Termination for Outdoor Shielded Cable: Heat-shrinkable type with heat-
5 shrinkable inner stress control and outer non-tracking tubes, multiple molded non-
6 tracking skirt modules, and compression-type connector.

7
8 Separable Insulated Connectors: Modular system, complying with IEEE Standard 386, shall
9 consist of disconnecting, single-pole cable terminators and matching stationary, plug-in,
10 dead-front terminals. System components shall be designed for the system voltage and for
11 sealing against moisture and shall conform to the following:

12
13 Cable Termination at Equipment (i.e. transformers or switchgear): Elbow-type
14 terminators that mate with bushing terminals in the equipment.

15
16 Load-Break Cable Terminators: Elbow-type units with 200-ampere load make/break and
17 continuous current rating as shown on the drawings. Each terminator shall be coordinated
18 with insulation diameter and conductor size and material of cable being terminated.
19 Terminator body shall have capacitively coupled test point. Load Break elbows shall be
20 sized to mate with existing sectionalizing Terminal as shown on drawings.

21
22 Grounding Kit: Grounding kit shall include jumpered elbows, portable feed-through
23 accessory units, protective caps, test rods suitable for concurrently grounding three-phases of
24 feeders, and carrying case.

25 26 PART 3--EXECUTION

27
28 EXAMINATION: Examine raceways to check for raceway blockages and cleanliness. Do
29 not proceed with cable installation until satisfactory conditions have been achieved.

30 31 INSTALLATION:

32
33 General: Install cable accessory items in accordance with manufacturer's written instructions
34 and as indicated.

35 36 INSTALLATION OF CABLES:

37
38 Install cable in accordance with manufacturers written instructions and at locations shown on
39 the drawings.

40 41 INSTALLATION OF TERMINATIONS:

42
43 Install Terminations: Install terminations at ends of conductors and seal multi conductor
44 cable ends with standard kits. Conform to manufacturers written instructions. Comply with

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

**Document Type: Construction Specifications Project Number: 021052
SPC Number: 352, Revision 1**

1 classes of terminations indicated. Cables not terminated within 3 hours shall be sealed to
2 eliminate the entrance of moisture.

3
4 Tighten Electrical Connectors and Terminals: Tighten electrical connectors and terminals in
5 accordance with manufacturer's torquing requirements. If requirements are not indicated,
6 tighten connectors and terminals to comply with tightening torques specified in UL 486A.

7
8 GROUNDING: Ground shields of shielded cable at terminations and separable insulation
9 connectors. Ground metal bodies of terminators, cable and separable insulated connector
10 fittings, and hardware in accordance with manufacturers written instructions.

11
12 FIELD QUALITY CONTROL:

13
14 Subcontractor Supplied Inspection and Testing:

15
16 Test Objectives: To ensure cable installation, including cable accessories, is
17 operational within industry and manufacturer's tolerances, is installed in accordance
18 with Contract Documents, and is suitable for energizing.

19
20 Procedures: Comply with National Electrical Testing Association (NETA) standard,
21 "Acceptance Testing Specifications for Electrical Power Distribution Equipment and
22 Systems", Section 7.3.2, Cables, Medium Voltage and IEEE 400.

23
24 Tests: After the termination kits are installed, but prior to terminating at the
25 equipment, the Subcontractor will perform cable testing. New cable shall be tested in
26 accordance with the manufacturer's recommendations for new cable. GFE cable is in
27 use and shall be tested in accordance with the manufacturer's recommendations for
28 used cable. Coordinate the testing with the Operating Contractors Power
29 Management group.

30
31 Test Report: The Subcontractor shall maintain a written record of observations and tests,
32 report defective materials and workmanship, and retest corrected defective items.
33 Subcontractor shall submit written reports to the Contractor Representative.

34
35 The Contractor's Representative, shall be informed of all cable test a minimum of 72 hrs in
36 advanced of any cable testing. The Contractor Representative shall witness or waive the
37 right to witness field tests and inspect the installation to determine compliance with the
38 specifications and drawings.

39
40 Contractor Inspection: Surveillance will be performed by the Contractor's Representative to
41 verify compliance of the work to the drawings and specifications.

42
43 END OF SECTION 16124

Project Title: OU7-10 Glovebox Excavator Method Project
Site Development
Document Type: Construction Specifications **Project Number:** 021052
SPC Number: 352, Revision 1

1 SECTION 16360--DISCONNECT SWITCHES 600 V AND LESS

2
3 PART 1--GENERAL

4
5 SUMMARY:

6
7 Section Includes, but is not limited to:

8
9 The Subcontractor shall provide and install electrical disconnect switches of types,
10 grades, and sizes as shown on the drawings. Provide complete assembly including,
11 but not necessarily limited to hubs, fuses, and other components and accessories as
12 needed for a complete system.

13
14 Related Sections:

15
16 16110 Electrical Raceways

17
18 REFERENCES:

19
20 The following documents including others referenced therein, form part of this Section to the
21 extent designated herein:

22
23 NATIONAL FIRE PROTECTION ASSOCIATION

24
25 NFPA 70 National Electrical Code (NEC)

26
27 NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION

28
29 NEMA ICS 2, Part 8 Disconnect Devices for Use in Industrial Control Equipment
30 NEMA 250 Enclosures for Electrical Equipment
31 5-WD Fuses

32
33 SUBMITTALS:

34
35 See Section 01300, Submittals and the Vendor Data Schedule for submittal requirements.

36
37 No vendor data required for this Section unless an "or equal" item is proposed.

38
39 PART 2--PRODUCTS

40
41 MANUFACTURERS:

42
43 Acceptable Manufacturers: Square D, General Electric and Cutler-Hammer or approved
44 equal.

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

**Document Type: Construction Specifications
SPC Number: 352, Revision 1**

Project Number: 021052

1 MATERIALS:

2

3 Disconnects: Disconnect switches shall be UL listed, NEMA type, [heavy duty] [general],
4 single throw, fused.

5

6 Switches shall be operated with external operating handle which is an integral part of the
7 box--not the cover. The operating mechanism shall be quick-make, quick-break and shall not
8 be capable of being restrained by the operating handle during the opening and closing
9 operation.

10

11 Dual interlocks shall interlock the switch box cover with the switch mechanism and shall
12 prevent opening or closing the box cover when the switch contacts are closed and the switch
13 mechanism is in the "ON" position. An interlock release shall be provided to defeat the
14 interlocking mechanism and to permit opening the box cover when the switch contacts are
15 closed. To defeat the interlock release and permit opening the box cover shall require an
16 external hand tool.

17

18 Switch handles shall be designed for padlocking in the "OFF" position, locking the door
19 closed to inhibit access to the switch. All current-carrying metal parts of the switch shall be
20 enclosed.

21

22 PART 3--EXECUTION

23

24 INSTALLATION:

25

26 Install disconnect switches as indicated on the drawings and in accordance with
27 manufacturer's written instructions, applicable requirements of NEC and National Electrical
28 Contractors Association's "Standard of Installation," and comply with recognized industry
29 practices to ensure that products serve intended functions.

30

31 Install disconnecting devices associated with motors within sight of the motor driven device
32 where practical. In all cases the disconnecting device shall be clearly labeled to distinguish
33 which motor/piece of equipment it disconnects.

34

35 LABELING:

36

37 Switches shall be labeled with phenolic labels, glued to the box. Switch identification shall
38 be as indicated on the drawings.

39

40 FIELD QUALITY CONTROL:

41

42 Site Tests: Visual inspection to determine that equipment installation conforms to NEC,
43 these specifications and the drawings.

44

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

Document Type: Construction Specifications Project Number: 021052

SPC Number: 352, Revision 1

1 Contractor Inspection: Surveillance will be performed by the Contractor's Representative to
2 verify compliance of the work to the drawings and specifications.

3

4 END OF SECTION 16360

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

**Document Type: Construction Specifications
SPC Number: 352, Revision 1**

Project Number: 021052

1 SECTION 16450--GROUNDING

2

3 PART 1--GENERAL

4

5 SUMMARY:

6

7 Section Includes: Work includes, but is not limited to:

8

9 Subcontractor shall provide and install grounding as shown on the drawings and as
10 recommended by the NEC and the NESC.

11

12 Related Sections:

13

14 16000 Electrical Sections

15

16 REFERENCES:

17

18 The following documents, including others referenced therein, form part of this Section to
19 the extent designated herein. Unless otherwise indicated use the latest edition in effect as of
20 the date of these specifications.

21

22 NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

23

24 NFPA 70 National Electrical Code (NEC)

25

26 AMERICAN NATIONAL STANDARDS ASSOCIATION (ANSI)

27

28 ANSI C2 National Electrical Safety Code (NESC)

29

30 SUBMITTALS:

31

32 See the Vendor Data Schedule. Subcontractor shall submit redline as-built drawings of the
33 grounding mat and grounding wire.

34

35 PART 2--PRODUCTS

36

37 MATERIALS:

38

39 Equipment grounding conductors shall be green insulated or bare copper, sized and located
40 as shown on the drawings.

41

42 Building grounding grid wire shall be a minimum of No. 2/0 AWG bare stranded copper
43 sized and located as shown on the drawings.

44

Project Title: OU7-10 Glovebox Excavator Method Project

Site Development

Document Type: Construction Specifications

Project Number: 021052

SPC Number: 352, Revision 1

1 Grounding grid connections below grade shall be made by the exothermic welding process or
2 listed nonreversible compression fittings.

3
4 Exothermic welds shall be Cadweld or approved equal.

5
6 Nonreversible compression fittings shall be Burndy HyGround or approved equal.

7
8 PART 3--EXECUTION

9
10 INSTALLATION:

11
12 Install a complete grounding system as indicated on the drawings in accordance with
13 applicable requirements of the NEC, the NESC, and complying with recognized industry
14 practices to ensure that products serve intended functions and comply with requirements.

15
16 All exposed noncurrent-carrying metallic parts of electrical equipment, raceway systems,
17 building steel, and the neutral conductor of the wiring system shall be grounded. The riser of
18 all firewater systems and all in-building, non-firewater, metallic piping shall be grounded.

19
20 In addition to the equipment grounding conductor routed with the branch circuit, the metal
21 frame of large equipment (i.e., firewater risers, etc.) shall be grounded via a No. 2 stranded,
22 bare copper grounding conductor to a grounding bus bar (separate from the service panel
23 grounding bus). The grounding bus bar shall be bonded to the building grounding grid as
24 shown on the drawings.

25
26 Beam or compression type grounding clamps shall be used for all above grade grounding
27 attachments to building steel. Exothermic welds to structural steel shall not be allowed.

28
29 All conduit (except spares) shall contain a dedicated grounding conductor.

30
31 Conduit shall not be used as the grounding conductor.

32
33 Grounding Rods: Grounding rods shall be driven around the building adjacent to the
34 grounding grid and connected thereto. The grounding rods shall be driven so that the top of
35 the rod is 1 ft below finished grade.

36
37 Nonreversible Compression Connections: Connections shall be made in accordance with
38 manufacturer's written recommendation.

39
40 Exothermic Welds: Exothermic welds shall be made in accordance with the manufacturer's
41 written recommendations.

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

**Document Type: Construction Specifications Project Number: 021052
SPC Number: 352, Revision 1**

1 FIELD QUALITY CONTROL:

2

3 Site Tests: The Subcontractor or his agents shall perform visual inspections to determine that
4 the grounding installation conforms to the NEC, these specifications, and the drawings.

5

6 Contractor Inspection: Surveillance will be performed by the Contractor's Representative to
7 verify compliance of the work to the drawings and specifications.

8

9 END OF SECTION 16450

Project Title: OU7-10 Glovebox Excavator Method Project
Site Development
Document Type: Construction Specifications **Project Number: 021052**
SPC Number: 352, Revision 1

1 SECTION 16603--AUTOMATIC TRANSFER SWITCH, DELAYED TRANSITION TYPE

2
3 PART 1--GENERAL

4
5 SUMMARY:

6
7 The automatic transfer switch shall consist of one NEMA rated enclosure wall mounted. The
8 switch shall meet or exceed all requirements set forth by Underwriters Laboratory
9 Standard 1008. The automatic transfer switch shall be rated 480 volts, 60 Hz, 3-phase(s) and
10 4 wire. It shall be rated for continuous load of 300 amperes, braced to withstand 35,000
11 Amperes RMS minimum, and shall be suitable for motor loads, resistance heating, electric-
12 discharge lighting and incandescent lighting.

13
14 Section Includes, but is not limited to:

15
16 The Subcontractor shall provide, install, and test the automatic transfer switch as
17 shown on the drawing and in this specification.

18
19 Related Sections:

- 20
21 16000 Electrical General Provisions
22 16120 Cable, Wire, Connectors and Miscellaneous Devices
23 16195 Electrical Identification
24 16450 Grounding

25
26 REFERENCES:

27
28 The following documents, including others referenced therein, form part of this Section to
29 the extent designated herein.

30
31 UNDERWRITERS' LABORATORIES, INC. (UL)

32
33 UL-1008 Temperature Rise Tests

34
35 AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

36
37 ANSI C37.91 Voltage Surge Test

38
39 NATIONAL ELECTRIC MANUFACTURER'S ASSOCIATION (NEMA)

40
41 NEMA 109.21 Voltage Impulse with Stand Test

42
43 SUBMITTALS:

44
45 See the Vendor Data Schedule.

46

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

**Document Type: Construction Specifications Project Number: 021052
SPC Number: 352, Revision 1**

1 PART 2--PRODUCTS

2

3 MATERIALS:

4

5 Contacts shall be of a double throw design mechanically interlocked to prevent simultaneous
6 inter-connection of both power sources. The contact driving system shall be mechanically
7 held and electrically operated. Both main and separate arcing contacts shall be provided.
8 The main contacts shall be a silver alloy, capable of making or breaking any load within the
9 rating of the switch.

10

11 The control module shall be of a solid state design.

12

13 The automatic transfer switch shall provide close differential voltage sensing of all phases of
14 the normal source of power. The settings shall be:

15

16 Standard factory settings, with pick up at 90% of normal voltage and drop-out at 85%
17 of pick-up voltage.

18

19 Upon interruption of the normal source of power, the alternate source shall be signaled after a
20 start time delay. The time delay shall be:

21

22 Standard factory setting.

23

24 The transfer of load shall occur after the alternate source has attained:

25

26 90% of normal voltage and 95% of normal frequency.

27

28 and, the transfer to alternate time delay has expired. The time delay shall be:

29

30 Field adjustable range of 0 to 1 min.

31

32 Upon return of the normal source to within the prescribed limits of the voltage sensor, the
33 automatic transfer switch shall retransfer to the normal source after a retransfer to normal
34 time delay. The time delay shall be:

35

36 Field adjustable of 0.5 to 30 min.

37

38 The engine-generator shall continue to run for the engine overrun time delay. The time delay
39 shall be:

40

41 Standard factory setting.

42

43 The automatic transfer switch shall have a contact which closes when the normal source fails
44 to initiate the start of the engine-generator set, rated 32 Vdc at 10 amperes. A contact which
45 opens to initiate the start of the engine-generator shall also be provided.

46

**Project Title: OU7-10 Glovebox Excavator Method Project
Site Development**

**Document Type: Construction Specifications Project Number: 021052
SPC Number: 352, Revision 1**

1 The automatic transfer switch shall have one auxiliary contact which is closed that indicates
2 the normal source is connected to the load and one auxiliary contact which is closed that
3 indicates the alternate source is connected to the load.

4
5 The automatic transfer switch shall be provided with a green pilot light which indicates that
6 the normal source is connected to the load and a red light which indicates that the alternate
7 source is connected to the load.

8
9 A test switch shall be provided which simulates a normal source outage.

10
11 In addition, the automatic transfer switch shall have the following optional accessories:

12
13 Reset switch to manually retransfer the automatic transfer switch to the normal
14 source.

15
16 A plant exerciser to test the engine-generator with load.

17
18 An in-phase monitor control for transfer and retransfer of motor loads.

19
20 The automatic transfer switch shall be Cutler-Hammer ATVS KD B 3 0300 X R U, or
21 approved equal.

22
23 PART 3--EXECUTION

24
25 INSTALLATION:

26
27 Install the automatic transfer switch as indicated on the drawings and in accordance with
28 manufacturer's written instructions, applicable requirements of NEC and National Electrical
29 Contractors Association's "Standard of Installation" and complying with recognized industry
30 practices to ensure that products serve intended functions.

31
32 FIELD QUALITY CONTROL:

33
34 Subcontractor Supplied Testing: With test switch connected, simulate a normal source
35 outage, and verify switch transfer and all auxiliary contacts, lights, and in-phase controller
36 work properly in accordance with requirements.

37
38 Contractor Inspection: Surveillance will be performed by Contractor's Representative to
39 verify compliance of the work to the drawings and specifications.

40
41 END OF SECTION 16603