

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT				1. CONTRACT ID CODE J	PAGE OF PAGES 1 3
2. AMENDMENT/MODIFICATION NO. 0005		3. EFFECTIVE DATE 18-Nov-2002	4. REQUISITION/PURCHASE REQ. NO. W68MD9-2219-3907		5. PROJECT NO.(If applicable)
6. ISSUED BY USA ENGINEER DISTRICT, SEATTLE ATTN: CENWS-CT P.O. BOX 3755 SEATTLE WA 98124-3755		CODE DACA67	7. ADMINISTERED BY (If other than item 6) See Item 6		
8. NAME AND ADDRESS OF CONTRACTOR (No., Street, County, State and Zip Code)				<input checked="" type="checkbox"/> 9A. AMENDMENT OF SOLICITATION NO. DACA67-03-R-0201	<input checked="" type="checkbox"/> 9B. DATED (SEE ITEM 11) 09-Oct-2002
				<input type="checkbox"/> 10A. MOD. OF CONTRACT/ORDER NO.	<input type="checkbox"/> 10B. DATED (SEE ITEM 13)
CODE		FACILITY CODE			
11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS					
<input checked="" type="checkbox"/> The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offer <input type="checkbox"/> is extended, <input checked="" type="checkbox"/> is not extended.					
Offer must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended by one of the following methods: (a) By completing Items 8 and 15, and returning <u>0</u> copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.					
12. ACCOUNTING AND APPROPRIATION DATA (If required)					
13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.					
A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.					
B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(B).					
C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:					
D. OTHER (Specify type of modification and authority)					
E. IMPORTANT: Contractor <input type="checkbox"/> is not, <input type="checkbox"/> is required to sign this document and return _____ copies to the issuing office.					
14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.) Combined Arms Collective Training Facility (CFCTF), Fort Lewis--See Attached. Address Technical Questions to: techbid@nws02.usace.army.mil					
Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.					
15A. NAME AND TITLE OF SIGNER (Type or print)			16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)		
			TEL: _____ EMAIL: _____		
15B. CONTRACTOR/OFFEROR _____ (Signature of person authorized to sign)		15C. DATE SIGNED	16B. UNITED STATES OF AMERICA BY _____ (Signature of Contracting Officer)		16C. DATE SIGNED 18-Nov-2002

SECTION SF 30 BLOCK 14 CONTINUATION PAGE

The following items are applicable to this modification:CONTINUATION PAGE

This amendment is issued to provide for the following revisions to the solicitation. The attached revised sections are to be replaced in their entirety. All changes are generally identified, for convenience, either by strikeout for deletions, and underlining of text for additions, or a single dark line in the right hand margin. All portions of the revised or new pages shall apply whether or not changes have been indicated.

- A. Revisions to Section 00800, Special Clauses, as follows:
 - 1. Revisions to Drawing Sheets A9.1, A9.7, A13.3, A14.1, A17.1, A23.1, A24.1, A29.1, A30.1, A32.1, A33.3, A33.5, A35.2, A36.2, A39.1, A40.1 and FP1.1.
 - 2. Revisions to Drawing Sheets C6.14, S0.1, S7.2, S19.3 and S26.1 by notation in the Special Clauses.
- B. Revision to Section 04200, MASONRY: Paragraph 2.4, Precast Concrete Items, has been deleted in its entirety; all ensuing paragraphs have been renumbered sequentially, beginning with 2.4, Mortar.
- C. Revision to Section 10430, EXTERIOR SIGNAGE, Paragraph 2.1.2.1.
- D. Deletion of Section 10505, METAL LOCKERS, in its entirety.
- E. Revision to Section 13121, PREENGINEERED METAL BUILDINGS, Paragraph 2.1.1.
- F. Revisions throughout Section 13920, FIRE PUMPS.
- G. The proposal submittal time and date, 2:00 p.m., 22 November 2002, remain unchanged.
- H. Offerors are to acknowledge receipt of this amendment by number and date on the Standard Form 1442 BACK, in Block 19.

ENCLOSURES:

Rev. Section 00800

Rev. Section 04200

Rev. Section 10430

Rev. Section 13121

Rev. Section 13920

Rev. Drawing Sheets A9.1, A9.7, A13.3, A14.1, A17.1, A23.1, A24.1, A29.1, A30.1, A32.1, A33.3, A33.5, A35.2, A36.2, A39.1, A40.1 and FP1.1

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SPECIAL CLAUSES

SC-1. COMMENCEMENT, PROSECUTION, AND COMPLETION OF WORK (APR 1984) (FAR 52.211-10).

The Contractor will be required to (a) commence work under this Contract within 10 calendar days after the date the Contractor receives the notice to proceed, (b) to prosecute the work diligently, and (c) to complete the entire work ready for use as shown below. The time stated for completion shall include final cleanup of the premises.

	<u>Completion Time</u>
SC-1.1 All work for Large After Action Review Facility at Range 17, as described in the Phasing Plan in Section 01005	210 Calendar days after Notice to Proceed for project.
SC-1.2 All work for the Shoot House and After Action Review facility at Range 32, as described in the Phasing Plan in Section 01005	210 Calendar days after Notice to Proceed for project.
SC-1.3 All work for Leschi Town Phase I, as described in the Phasing Plan in Section 01005	300 Calendar days after Notice to Proceed for project.
SC-1.4 All work for Leschi Town Phase II, as described in the Phasing Plan in Section 01005	420 Calendar days after Notice to Proceed for project.
SC-1.5 All other work, including Leschi Town Phase III and the Breach Facility at Range 62, as described in the Phasing Plan in Section 01005	545 Calendar days after Notice to Proceed for project.

SC-1.6 OPTION FOR INCREASED QUANTITY

a. The Government may increase the quantity of work awarded by exercising one or more of the Optional Bid Item(s) 0009 through 0018 at any time, or not at all, but no later than 60 calendar days after receipt by Contractor of notice to proceed. Notice to proceed on work Item(s) added by exercise of the option(s) will be given upon execution of consent of surety.

b. The parties hereto further agree that any option herein shall be considered to have been exercised at the time the Government deposits written notification to the Contractor in the mails.

c. The time allowed for completion of any optional items awarded under this contract will be the same as that for the base item(s), and will be measured from the date of receipt of the notice to proceed for the base item(s).

SC-1.2 Exception to Completion Period(s): In case the Contracting Officer determines that completion of seeding, sodding, and planting, and establishment of same is not feasible within the completion period(s) stated above, the Contractor shall accomplish such work in the first planting period following the contract completion period and shall complete such work as specified, unless other planting periods are directed or approved by the Contracting Officer.

SC-2. LIQUIDATED DAMAGES - CONSTRUCTION (SEP 2000) (FAR 52.211-12)

(a) If the Contractor fails to complete the work within the time specified in the Contract, or any extension, the Contractor shall pay to the Government as liquidated damages, the sums as shown in the schedule below for each day of delay.

(1) All Work Specified in Paragraph SC-1.1	\$ 1,100.00
(2) All Work Specified in Paragraph SC-1.2	\$ 1,100.00
(3) All Work Specified in Paragraph SC-1.3	\$ 1,100.00
(4) All Work Specified in Paragraph SC-1.4	\$ 1,100.00
(5) All Work Specified in Paragraph SC-1.5	\$ 1,100.00

(6) Liquidated damages under this contract shall in no event exceed a total of \$1,100.00 per day, even if the Contractor is delinquent at any one time in completing more than one of the items of work.

(b) If the Government terminates the Contractor's right to proceed, the resulting damage will consist of liquidated damages until such reasonable time as may be required for final completion of the work together with any increased costs occasioned the Government in completing the work.

(c) If the Government does not terminate the Contractor's right to proceed, the resulting damage will consist of liquidated damages until the work is completed or accepted.

(d) Exception to Liquidated Damage: In case the Contracting Officer determines that completion of work stated above in paragraph Exception to Completion Period(s) is not feasible during the completion period(s) stated in SC-1, such work will be exempted from liquidated damages.

SC-3 DELETED.

SC-4. VARIATIONS IN ESTIMATED QUANTITIES - SUBDIVIDED ITEMS (MAR 1995)
(EFARS 52.212-5001): This variation in estimated quantities clause is applicable only to Item No. 0005.

(a) Variation from the estimated quantity in the actual work performed under any second or subsequent sub-item or elimination of all work under such a second or subsequent sub-item will not be the basis for an adjustment in contract unit price.

(b) Where the actual quantity of work performed for Items No. 0005 is less than 85 % of the quantity of the first sub-item listed under such item, the Contractor will be paid at the contract unit price for that sub-item for the actual quantity of work performed and, in addition, an equitable adjustment shall be made in accordance with the clause FAR 52.211-18, Variation in Estimated Quantities.

(c) If the actual quantity of work performed under Items No. 0005 exceeds 115 percent or is less than 85 percent of the total estimated quantity of the sub-item under that item and/or if the quantity of the work performed under the second sub-item or any subsequent sub-item under Items No. 0005 exceeds 115 % or is less than 85 % of the estimated quantity of any such sub-item, and if such variation causes an increase or a decrease in the time required for performance of this contract the contract completion time will be adjusted in accordance with the clause FAR 52.211-18, Variation in Estimated Quantities.

SC-5. INSURANCE - WORK ON A GOVERNMENT INSTALLATION (JAN 1997) (FAR 52.228-5)

(a) The Contractor shall, at its own expense, provide and maintain during the entire performance period of this Contract at least the kinds and minimum amounts of insurance required in the Insurance Liability Schedule or elsewhere in the Contract.

(b) Before commencing work under this Contract, the Contractor shall certify to the Contracting Officer in writing that the required insurance has been obtained. The policies evidencing required insurance shall contain an endorsement to the effect that any cancellation or any material change adversely affecting the Government's interest shall not be effective:

(1) for such period as the laws of the State in which this Contract is to be performed prescribe;
or

(2) until 30 days after the insurer or the Contractor gives written notice to the Contracting Officer, whichever period is longer.

(c) The Contractor shall insert the substance of this clause, including this paragraph (c), in subcontracts under this Contract that require work on a Government installation and shall require subcontractors to provide and maintain the insurance required in the Schedule or elsewhere in the Contract. The Contractor shall maintain a copy of all subcontractors' proofs of required insurance, and shall make copies available to the Contracting Officer upon request.

(d) Insurance Liability Schedule (FAR 28.307-2)

(1) Workers' compensation and employer's liability. Contractors are required to comply with applicable Federal and State workers' compensation and occupational disease statutes. If occupational diseases are not compensable under those statutes, they shall be covered under the employer's liability section of the insurance policy, except when Contract operations are so commingled with a Contractor's commercial operation that it would not be practical to require this coverage. Employer's liability coverage of at least \$100,000 shall be required, except in states with exclusive or monopolistic funds that do not permit workers' compensation to be written by private carriers.

(2) General Liability.

(a) The Contracting Officer shall require bodily injury liability insurance coverage written on the comprehensive form of policy of at least \$500,000 per occurrence.

(b) Property damage liability insurance shall be required only in special circumstances as determined by the agency.

(3) Automobile liability. The Contracting Officer shall require automobile liability insurance written on the comprehensive form of policy. The policy shall provide for bodily injury and property damage liability covering the operation of all automobiles used in connection with performing the Contract. Policies covering automobiles operated in the United States shall provide coverage of at least \$200,000 per person and \$500,000 per occurrence for bodily injury and \$20,000 per occurrence for property damage. The amount of liability coverage on other policies shall be commensurate with any legal requirements of the locality and sufficient to meet normal and customary claims.

(4) Aircraft public and passenger liability. When aircraft are used in connection with performing the Contract, the Contracting Officer shall require aircraft public and passenger liability insurance. Coverage shall be at least \$200,000 per person and \$500,000 per occurrence for bodily injury, other than passenger liability, and \$200,000 per occurrence for property damage. Coverage for passenger liability bodily injury shall be at least \$200,000 multiplied by the number of seats or passengers, whichever is greater.

(5) Environmental Liability If this contract includes the transport, treatment, storage, or disposal of hazardous material waste the following coverage is required.

The Contractor shall ensure the transporter and disposal facility have liability insurance if effect for claims arising out of the death or bodily injury and property damage from hazardous material/waste transport, treatment, storage and disposal, including vehicle liability and legal defense costs in the amount of \$1,000,000.00 as evidenced by a certificate of insurance for General, Automobile, and Environmental Liability Coverage. Proof of this insurance shall be provided to the Contracting Officer.

SC-6 DELETED.

SC-7. PERFORMANCE OF WORK BY THE CONTRACTOR (APR 1984) (FAR 52.236-1): The Contractor shall perform on the site, and with its own organization, work equivalent to at least fifteen percent (15%) of the total amount of work to be performed under the Contract. The percentage may be reduced by a supplemental agreement to this Contract if, during performing the work, the Contractor requests a reduction and the Contracting Officer determines that the reduction would be to the advantage of the Government.

SC-8. PHYSICAL DATA (APR 1984) (FAR 52.236-4): Data and information furnished or referred to below is for the Contractor's information. The Government will not be responsible for any interpretation of or conclusion drawn from the data or information by the Contractor.

(a) Physical Conditions: The indications of physical conditions on the drawings and in the specifications are the result of site investigations by test holes shown on the drawings.

(b) Weather Conditions: Each bidder shall be satisfied before submitting his bid as to the hazards likely to arise from weather conditions. Complete weather records and reports may be obtained from any National Weather Service Office.

(c) Transportation Facilities: Each bidder, before submitting his bid, shall make an investigation of the conditions of existing public and private roads and of clearances, restrictions, bridge load limits, and other limitations affecting transportation and ingress and egress at the jobsite. The unavailability of transportation facilities or limitations thereon shall not become a basis for claims for damages or extension of time for completion of the work.

SC-9 DELETED.

SC-10. LAYOUT OF WORK (APR 1984) (FAR 52.236-17): The Contractor shall lay out its work from Government-established base lines and bench marks indicated on the drawings, and shall be responsible for all measurements in connection with the layout. The Contractor shall furnish, at its own expense, all stakes, templates, platforms, equipment, tools, materials, and labor required to lay out any part of the work. The Contractor shall be responsible for executing the work to the lines and grades that may be established or indicated by the Contracting Officer. The Contractor shall also be responsible for

maintaining and preserving all stakes and other marks established by the Contracting Officer until authorized to remove them. If such marks are destroyed by the Contractor or through its negligence before their removal is authorized, the Contracting Officer may replace them and deduct the expense of the replacement from any amounts due, or to become due, to the Contractor.

SC-11. RESERVED

SC-12 AND SC-13 DELETED.

SC-14. EQUIPMENT OWNERSHIP AND OPERATING EXPENSE SCHEDULE (MAY 1999)-
(EFARS 52.231-5000)

(a) This clause does not apply to terminations. See 52.249-5000, Basis for Settlement of Proposals and FAR Part 49.

(b) Allowable cost for construction and marine plant and equipment in sound workable condition owned or controlled and furnished by a contractor or subcontractor at any tier shall be based on actual cost data for each piece of equipment or groups of similar serial and series for which the Government can determine both ownership and operating costs from the contractor's accounting records. When both ownership and operating costs cannot be determined for any piece of equipment or groups of similar serial or series equipment from the contractor's accounting records, costs for that equipment shall be based upon the applicable provisions of EP 1110-1-8, Construction Equipment Ownership and Operating Expense Schedule, Region VIII. Working conditions shall be considered to be average for determining equipment rates using the schedule unless specified otherwise by the contracting officer. For equipment not included in the schedule, rates for comparable pieces of equipment may be used or a rate may be developed using the formula provided in the schedule. For forward pricing, the schedule in effect at the time of negotiations shall apply. For retroactive pricing, the schedule in effect at the time the work was performed shall apply.

(c) Equipment rental costs are allowable, subject to the provisions of FAR 31.105(d)(ii) and FAR 31.205-36. Rates for equipment rented from an organization under common control, lease-purchase arrangements, and sale-leaseback arrangements, will be determined using the schedule, except that actual rates will be used for equipment leased from an organization under common control that has an established practice of leasing the same or similar equipment to unaffiliated lessees.

(d) When actual equipment costs are proposed and the total amount of the pricing action exceeds the small purchase threshold, the contracting officer shall request the contractor to submit either certified cost or pricing data, or partial/limited data, as appropriate. The data shall be submitted on Standard Form 1411, Contract Pricing Proposal Cover Sheet.

(e) Copies of EP1110-1-8 "Construction Equipment Ownership and Operating Expense Schedule" Volumes 1 through 12 are available in Portable Document Format (PDF) and can be viewed or downloaded at <http://www.usace.army.mil/inet/usace-docs/eng-pamphlets/cecw.htm>. A CD-ROM containing (Volumes 1-12) is available through either the Superintendent of Documents or Government bookstores. For additional information telephone 202-512-2250, or access on the Internet at http://www.access.gpo.gov/su_docs.

SC-15. PAYMENT FOR MATERIALS DELIVERED OFF-SITE (MAY 1999)-(EFARS 52.232-5000)

(a) Pursuant to FAR clause 52.232-5, Payments Under Fixed Priced Construction Contracts, materials delivered to the contractor at locations other than the site of the work may be taken into consideration in making payments if included in payment estimates and if all the conditions of the General Provisions are fulfilled. Payment for items delivered to locations other than the work site will be limited to:

(1) materials required by the technical provisions; or (2) materials that have been fabricated to the point where they are identifiable to an item of work required under this contract.

(b) Such payment will be made only after receipt of paid or receipted invoices or invoices with canceled check showing title to the items in the prime contractor and including the value of material and labor incorporated into the item. In addition to petroleum products, payment for materials delivered off-site is limited to the following items: Any other construction material stored offsite may be considered in determining the amount of a progress payment.

SC-16 AND SC-17 DELETED

SC-18. CONTRACT DRAWINGS AND SPECIFICATIONS (AUG 2000)(DOD FAR SUPP 252.236-7001)

(a) The Government will provide to the Contractor, without charge, one set of contract drawings and specifications, except publications incorporated into the technical provisions by reference, in electronic or paper media as chosen by the Contracting Officer.

(b) The Contractor shall--

- (1) Check all drawings furnished immediately upon receipt;
- (2) Compare all drawings and verify the figures before laying out the work;
- (3) Promptly notify the Contracting Officer of any discrepancies;
- (4) Be responsible for any errors which might have been avoided by complying with this paragraph (b); and
- (5) Reproduce and print contract drawings and specifications as needed.

(c) In general—

- (1) Large scale drawings shall govern small scale drawings; and
- (2) The Contractor shall follow figures marked on drawings in preference to scale measurements.

(d) Omissions from the drawings or specifications or the misdescription of details of work which are manifestly necessary to carry out the intent of the drawings and specifications, or that are customarily performed, shall not relieve the Contractor from performing such omitted or misdescribed details of the work. The Contractor shall perform such details as if fully and correctly set forth and described in the drawings and specifications.

(e) The work shall conform to the specifications and the contract drawings identified in the index of drawings attached at the end of the Special Clauses.

SC-19 THROUGH SC-21 DELETED.

SC-22. EPA ENERGY STAR: The Government requires that certain equipment be Energy Star compliant. Initially, the sole Energy Star requirement shall be the self certification by the bidder that the specified equipment is Energy Star compliant. Within 3 months of the availability of an EPA sanctioned test for Energy Star compliance, the Contractor shall submit all equipment upgrades and additions for testing and provide proof of compliance to the Government upon completion of testing. Testing shall be at the Contractor's expense.

SC-23. RECOVERED MATERIALS: The Corps of Engineers encourages all bidders to utilize recovered materials to the maximum extent practicable. The attached APPENDIX R contains procurement guidelines for products containing recovered materials.

APPENDIX R

PART 247 - COMPREHENSIVE PROCUREMENT GUIDELINE FOR PRODUCTS CONTAINING RECOVERED MATERIALS

40 CFR Ch. 1 (9-1-99 Edition)

Subpart B-Item Designations

§ 247.10 Paper and paper products.

Paper and paper products, excluding building and construction paper grades.

§ 247.11 Vehicular products.

(a) Lubricating oils containing re-refined oil, including engine lubricating oils, hydraulic fluids, and gear oils, excluding marine and aviation oils.

(b) Tires, excluding airplane tire

(c) Reclaimed engine coolants, excluding coolants used in non-vehicular applications.

247.12 Construction products.

(a) Building insulation product including the following items:

(1) Loose-fill insulation, including but not limited to cellulose fiber, mineral fibers (fiberglass and rock vermiculite, and perlite);

(2) Blanket and batt insulation, including but not limited to mineral fibers (fiberglass and rock wool).

(3) Board (sheathing, roof decking wall panel) insulation, including but not limited to structural fiberboard and laminated paperboard products perlite composite board, polyurethane, polyisocyanurate, polystyrene, phenolics, and composites; and

(4) Spray-in-place insulation, including but not limited to foam-in-place polyurethane and polyisocyanurate and spray-on cellulose.

(b) Structural fiberboard and laminated paperboard products for applications other than building insulation, including building board, sheathing shingle backer, sound deadening board, roof insulating board, insulating wallboard, acoustical and non-acoustical ceiling tile, acoustical and non-acoustical lay-in panels, floor underlayments, and roof overlay (cover board).

(c) Cement and concrete, including concrete products such as pipe and block, containing coal fly ash ground granulated blast furnace (GGBF) slag.

(d) Carpet made of polyester fiber use in low- and medium-wear applications.

(e) Floor tiles and patio block containing recovered rubber or plastic.

(f) Shower and restroom dividers/partitions containing recovered plastic or steel.

(g) (1) Consolidated latex paint used for covering graffiti; and

(2) Reprocessed latex paint used for interior and exterior architectural applications such as wallboard, ceilings, and trim; gutter boards; and concrete, stucco, masonry, wood and metal surfaces.

§247.13 Transportation products.

(a) Traffic barricades and traffic cones used in controlling or restricting vehicular traffic.

(b) Parking stops made from concrete or containing recovered plastic or rubber.

(c) Channelizers containing recovered plastic or rubber.

- (d) Delineators containing recovered plastic, rubber, or steel.
- (e) Flexible delineators containing recovered plastic.

§ 247.14 Park and recreation products

- (a) Playground surfaces and running tracks containing recovered rubber or plastic.
- (b) Plastic fencing containing recovered plastic for use in controlling snow or sand drifting and as a warning/safety barrier in construction or other applications.

247.15 Landscaping products.

- (a) Hydraulic mulch products containing recovered paper or recovered wood used for hydroseeding and as an over-spray for straw mulch in landscaping, erosion control, and soil reclamation.
- (b) Compost made from yard trimmings, leaves, and/or grass clippings for use in landscaping, seeding of grass or other plants on roadsides and embankments, as a nutritious mulch under trees and shrubs, and in erosion control and soil reclamation.
- (c) Garden and soaker hoses containing recovered plastic or rubber.
- (d) Lawn and garden edging containing recovered plastic or rubber.

§ 247.16 Non-paper office product.

- (a) Office recycling containers and office waste receptacles.
- (b) Plastic desktop accessories.
- (c) Toner cartridges.
- (d) Binders.
- (e) Plastic trash bags.
- (f) Printer ribbons.
- (g) Plastic envelopes.

§ 247.17 Miscellaneous products.

Pallets containing recovered wood, plastic, or paperboard.

INDEX OF DRAWINGS

COMBINED ARMS COLLECTIVE TRAINING FACILITY
FORT LEWIS, WASHINGTON

Project Number: 13643

22s/171-90-11

SHEET NUMBER	PLATE NUMBER	TITLE	REVISION NUMBER	DATE
<u>GENERAL</u>				
1	G1.1	TITLE AND AREA MAPS		30 SEP 2002
2	G1.2	INDEX SHEET I	A	25 OCT 2002
3	G1.3	INDEX SHEET II		30 SEP 2002
4	G1.4	LOCATION MAP		30 SEP 2002
<u>GEOTECHNICAL</u>				
5	GT1.1	EXPLORATION LOGS		30 SEP 2002
6	GT1.2	EXPLORATION LOGS		30 SEP 2002
7	GT1.3	EXPLORATION LOGS		30 SEP 2002
8	GT1.4	EXPLORATION LOGS		30 SEP 2002
9	GT1.5	EXPLORATION LOGS		30 SEP 2002
10	GT1.6	EXPLORATION LOGS		30 SEP 2002
11	GT1.7	EXPLORATION LOGS		30 SEP 2002
12	GT1.8	EXPLORATION LOGS		30 SEP 2002
<u>RANGE 17 – LARGE AAR COMPLEX</u>				
13	GT2.1	LOCATIONS OF EXPLORATIONS - SITE PLAN		30 SEP 2002
<u>LESHI TOWN</u>				
14	GT3.1	LOCATIONS OF EXPLORATIONS - SITE PLAN		30 SEP 2002

SHEET NUMBER	PLATE NUMBER	TITLE	REVISION NUMBER	DATE
<u>RANGE 32 – SMALL AAR COMPLEX</u>				
15	GT4.1	LOCATIONS OF EXPLORATIONS - SITE PLAN		30 SEP 2002
<u>RANGE 62 – BREACH FACILITY</u>				
16	GT5.1	LOCATIONS OF EXPLORATIONS - SITE PLAN		30 SEP 2002
<u>CIVIL</u>				
17	CO.1	LEGEND AND ABBREVIATIONS		30 SEP 2002
<u>RANGE 17 – LARGE AAR COMPLEX</u>				
18	C1.1	SITE PLAN		30 SEP 2002
19	C1.2	GRADING PLAN		30 SEP 2002
20	C1.3	UTILITY PLAN		30 SEP 2002
<u>LESCHI TOWN</u>				
21	C2.1	GENERAL SITE PLAN		30 SEP 2002
22	C2.2	DEMOLITION PLAN		30 SEP 2002
23	C2.3	SITE PLAN I		30 SEP 2002
24	C2.4	SITE PLAN 2		30 SEP 2002
25	C2.5	SITE PLAN 3		30 SEP 2002
26	C2.6	SITE PLAN 4		30 SEP 2002
27	C2.7	SITE PLAN 5		30 SEP 2002
28	C2.8	SITE PLAN 6		30 SEP 2002
29	C2.9	SITE PLAN 7		30 SEP 2002
30	C2.10	SITE PLAN 8		30 SEP 2002
31	C2.11	SITE PLAN 9		30 SEP 2002
32	C2.12	SITE PLAN 10		30 SEP 2002

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33	C2.13	GRADING PLAN 1		30 SEP 2002
34	C2.14	GRADING PLAN 2		30 SEP 2002
35	C2.15	GRADING PLAN 3		30 SEP 2002
36	C2.16	GRADING PLAN 4		30 SEP 2002
37	C2.17	GRADING PLAN 5		30 SEP 2002
38	C2.18	GRADING PLAN 6		30 SEP 2002
39	C2.19	GRADING PLAN 7		30 SEP 2002
40	C2.20	GRADING PLAN 8		30 SEP 2002
41	C2.21	GRADING PLAN 9		30 SEP 2002
42	C2.22	GRADING PLAN 10		30 SEP 2002
43	C2.23	UTILITY PLAN 2		30 SEP 2002
44	C2.24	UTILITY PLAN 3		30 SEP 2002
45	C2.25	UTILITY PLAN 4		30 SEP 2002
<u>RANGE 32 - SHOOTHOUSE</u>				
46	C3.1	SITE PLAN		30 SEP 2002
<u>RANGE 62 – BREACH FACILITY</u>				
47	C4.1	SITE PLAN		30 SEP 2002
48	C4.2	FENCE STANDOFF PLAN		30 SEP 2002
<u>PROFILES</u>				
49	C5.1	1 ST SPECIAL FORCES BLVD PROFILE 1		30 SEP 2002
50	C5.2	1 ST SPECIAL FORCES BLVD PROFILE 2		30 SEP 2002
51	C5.3	I CORPS BLVD PROFILE 1		30 SEP 2002
52	C5.4	I CORPS BLVD PROFILE 2		30 SEP 2002
53	C5.5	23 RD INFANTRY WAY PROFILE		30 SEP 2002

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54	C5.6	120 TH INFANTRY WAY/LANCER WAY PROFILE		30 SEP 2002
55	C5.7	SUA SPONTE CIRCLE/ARROWHEAD WAY PROFILE		30 SEP 2002
56	C5.8	24 TH INFANTRY WAY PROFILE		30 SEP 2002
57	C5.9	GOEDKOOP SHANNON RAILROAD PROFILE		30 SEP 2002
58	C5.10	CANAL PROFILE		30 SEP 2002
<u>SECTIONS AND DETAILS</u>				
59	C6.1	ENLARGED CEMETERY PLAN		30 SEP 2002
60	C6.2	ENLARGED RESIDENTIAL HOUSING PLAN		30 SEP 2002
61	C6.3	SECTIONS		30 SEP 2002
62	C6.4	CONCRETE JOINT LAYOUT PLAN 1		30 SEP 2002
63	C6.5	CONCRETE JOINT LAYOUT PLAN 2 (OPTION)		30 SEP 2002
64	C6.6	CONCRETE JOINT LAYOUT PLAN 3 (OPTION)		30 SEP 2002
65	C6.7	CONCRETE JOINT DETAILS		30 SEP 2002
66	6.8	UTILITY DETAILS 1		30 SEP 2002
67	C6.9	UTILITY DETAILS 2		30 SEP 2002
68	C6.10	UTILITY DETAILS 3		30 SEP 2002
69	C6.11	UTILITY DETAILS 4		30 SEP 2002
70	C6.12	MISCELLANEOUS DETAILS 1		30 SEP 2002
71	C6.13	MISCELLANEOUS DETAILS 2		30 SEP 2002
72	C6.14	FENCING DETAIL 1		30 SEP 2002
73	C6.15	FENCING DETAIL 2		30 SEP 2002

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74	C6.16	FENCING DETAIL 3		30 SEP 2002
75	C6.17	FENDING DETAIL 4		30 SEP 2002
<u>LANDSCAPE</u>				
76	LO.1	LANDSCAPE PLANT LIST, LEGEND & GENERAL NOTES		30 SEP 2002
<u>RANGE 17 – LARGE AAR COMPLEX</u>				
77	L1.1	LANDSCAPE PLAN		30 SEP 2002
78	L1.2	IRRIGATION PLAN		30 SEP 2002
<u>LESCHI TOWN</u>				
79	L2.1	LANDSCAPE PLAN 1		30 SEP 2002
80	L2.2	LANDSCAPE PLAN 2		30 SEP 2002
81	L2.3	LANDSCAPE PLAN 3		30 SEP 2002
82	L2.4	LANDSCAPE PLAN 4		30 SEP 2002
83	L2.5	LANDSCAPE PLAN 5		30 SEP 2002
84	L2.6	LANDSCAPE PLAN 6		30 SEP 2002
85	L2.7	LANDSCAPE PLAN 7		30 SEP 2002
86	L2.8	LANDSCAPE PLAN 8		30 SEP 2002
87	L2.9	LANDSCAPE PLAN 9		30 SEP 2002
88	L2.10	LANDSCAPE PLAN 10		30 SEP 2002
89	L5.1	LANDSCAPE DETAILS 1		30 SEP 2002
90	L5.2	LANDSCAPE DETAILS 2		30 SEP 2002
91	L5.3	LANDSCAPE DETAILS 3		30 SEP 2002
<u>ARCHITECTURAL</u>				
92	A0.1	ARCHITECTURAL ABBREVIATIONS		30 SEP 2002
93	A0.2	GENERAL ARCHITECTURAL NOTES	A	08NOV2002

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<u>RANGE 17 – LARGE AAR COMPLEX</u>				
94	A1.1	CONTROL CENTER PLANS		30 SEP 2002
95	A1.2	CONTROL CENTER ELEVATIONS		30 SEP 2002
96	A2.1	AAR BUILDING PLANS	A	24 OCT 2002
97	A2.2	AAR BUILDING ELEVATIONS		30 SEP 2002
98	A3.1	WORKSHOP PLANS	A	08NOV2002
99	A3.2	WORKSHOP ELEVATIONS		30 SEP 2002
100	A4.1	LATRINE PLANS		30 SEP 2002
101	A4.2	LATRINE ELEVATIONS		30 SEP 2002
102	A5.1	PUMPHOUSE PLANS & ELEVATIONS	A	04NOV2002
<u>LESCHI TOWN</u>				
103	A6.1	FIVE STORY OFFICE PLANS I		30 SEP 2002
104	A6.2	FIVE STORY OFFICE PLANS II	A	04NOV2002
105	A6.3	FIVE STORY OFFICE ELEVATIONS		30 SEP 2002
106	A6.4	FIVE STORY OFFICE BUILDING SECTION		30 SEP 2002
107	A7.1	RETAIL BLDG. “A” FLOOR & ROOF PLANS	A	08NOV2002
108	A7.2	RETAIL BLDG. “A” ELEVATIONS		30 SEP 2002
109	A8.1	THREE STORY OFFICE FLOOR & ROOF PLANS		30 SEP 2002
110	A8.2	THREE STORY OFFICE ELEVATIONS		30 SEP 2002
111	A8.3	THREE STORY OFFICE BLDG. SECTION		30 SEP 2002
112	A8.4	THREE STORY OFFICE ENLARGED STAIR PLANS/STAIR SECTION	A	08NOV2002
113	A9.1	RESIDENCE – TYPE A FLOOR & ROOF PLANS	<u>B</u>	<u>15NOV2002</u>

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114	A9.2	RESIDENCE – TYPE A ELEVATIONS		30 SEP 2002
115	A9.3	RESIDENCE – TYPE B FLOOR & ROOF PLANS	A	24 OCT 2002
116	A9.4	RESIDENCE – TYPE B ELEVATIONS		30 SEP 2002
117	A9.5	RESIDENCE – TYPE C FLOOR & ROOF PLANS	A	04NOV2002
118	A9.6	RESIDENCE – TYPE C ELEVATIONS		30 SEP 2002
119	A9.7	RESIDENCE – TYPE D FLOOR & ROOF PLANS	<u>A</u>	<u>15NOV2002</u>
120	A9.8	RESIDENCE – TYPE D ELEVATIONS		30 SEP 2002
121	A9.9	WAREHOUSE “A” FLOOR PLAN		30 SEP 2002
122	A10.2	WAREHOUSE “A” ELEVATIONS		30 SEP 2002
123	A10.3	WAREHOUSE “A” BLDG. SECTION		30 SEP 2002
124	A11.1	WAREHOUSE “B” FLOOR PLAN		30 SEP 2002
125	A11.2	WAREHOUSE “B” ELEVATIONS		30 SEP 2002
126	A12.1	TOWNHOUSE FLOOR & ROOF PLANS	A	04NOV2002
127	A12.2	TOWNHOUSE ELEVATIONS		30 SEP 2002
128	A13.1	HOTEL FLOOR & ROOF PLANS		30 SEP 2002
129	A13.2	HOTEL BUILDING ELEVATIONS	A	08NOV2002
130	A13.3	HOTEL BUILDING SECTION	<u>B</u>	<u>15NOV2002</u>
131	A14.1	SCHOOL FLOOR PLANS	<u>B</u>	<u>15NOV2002</u>
132	A14.2	SCHOOL ROOF PLAN		30 SEP 2002
133	A14.3	SCHOOL BUILDING ELEVATIONS		30 SEP 2002
134	A14.4	SCHOOL BUILDING SECTION/STAIR DETAILS		30 SEP 2002
135	A15.1	CHURCH FLOOR & ROOF PLANS		30 SEP 2002

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136	A15.2	CHURCH ELEVATIONS		30 SEP 2002
137	A16.1	BANK FLOOR & ROOF PLANS		30 SEP 2002
138	A16.2	BANK ELEVATIONS		30 SEP 2002
139	A17.1	POLICE STATION FLOOR & ROOF PLANS	<u>B</u>	<u>15NOV2002</u>
140	A17.2	POLICE STATION ELEVATIONS	A	08NOV2002
141	A18.1	SERVICE STATION FLOOR & ROOF PLANS	A	04NOV2002
142	A18.2	SERVICE STATION ELEVATIONS	A	08NOV2002
143	A19.1	CLINIC FLOOR & ROOF PLANS	A	04NOV2002
144	A19.2	CLINIC ELEVATIONS		30 SEP 2002
145	A20.1	PUMPHOUSE PLANS & ELEVATIONS		30 SEP 2002
146	A21.1	MUNICIPAL BLDG. FLOOR PLANS		30 SEP 2002
147	A21.2	MUNICIPAL BLDG. FLOOR & ROOF PLANS		30 SEP 2002
148	A21.3	MUNICIPAL BLDG. ELEVATIONS		30 SEP 2002
149	A21.4	MUNICIPAL BLDG. BLDG. SECTION/ELE. SHAFT WITH STAIR SECTION		30 SEP 2002
150	A22.1	TOWN HALL FLOOR & ROOF PLANS	A	08NOV2002
151	A22.2	TOWN HALL BUILDING ELEVATIONS		30 SEP 2002
152	A22.3	TOWN HALL BUILDING SECTION / SECTION DETAILS		30 SEP 2002
153	A23.1	FIRE STATION FLOOR & ROOF PLANS	<u>A</u>	<u>15NOV2002</u>
154	A23.2	FIRE STATION ELEVATIONS	A	08NOV2002
155	A24.1	POST OFFICE FLOOR & ROOF PLANS	<u>B</u>	<u>15NOV2002</u>
156	A24.2	POST OFFICE ELEVATIONS		30 SEP 2002

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157	A25.1	OPEN AIR MARKET PLANS	A	08NOV2002
158	A25.2	OPEN AIR MARKET ELEVATIONS		30 SEP 2002
<u>LESCHI TOWN – GARRISON AREA</u>				
159	A26.1	BARRACKS FLOOR & ROOF PLANS		30 SEP 2002
160	A26.2	BARRACKS BUILDING ELEVATIONS		30 SEP 2002
161	A26.3	HEADQUARTERS FLOOR & ROOF PLANS		30 SEP 2002
162	A26.4	HEADQUARTERS BUILDING ELEVATIONS		30 SEP 2002
163	A26.5	MESS & SUPPLY FLOOR & ROOF PLANS	A	08NOV2002
164	A26.6	MESS & SUPPLY BUILDING ELEVATIONS		30 SEP 2002
165	A26.7	SHOWER/LATRINE FLOOR PLANS		30 SEP 2002
166	A26.8	SHOWER/LATRINE BUILDING ELEVATIONS		30 SEP 2002
<u>LESCHI TOWN</u>				
167	A27.1	RADIO STATION BUILDING PLANS		30 SEP 2002
168	A27.2	RADIO STATION BUILDING ELEVATIONS		30 SEP 2002
169	A28.1	JUNKYARD OFFICE PLANS/ELEVATIONS		30 SEP 2002
170	A29.1	FUEL STATION ATTENDANT BLDG.	<u>A</u>	<u>15NOV2002</u>
171	A29.2	FUEL STATION PUMP ISLAND		30 SEP 2002
<u>LESCHI TOWN - FARM</u>				
172	A30.1	FARMHOUSE PLANS	<u>B</u>	<u>15NOV2002</u>
173	A30.2	FARMHOUSE ELEVATIONS	A	08NOV2002
174	A30.3	BARN PLANS	A	08NOV2002

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175	A30.4	BARN ELEVATIONS		30 SEP 2002
176	A30.5	CHICKEN HOUSE PLANS/ELEVATIONS		30 SEP 2002
177	A30.6	ROOT CELLAR/STORAGE SHACK PLANS/SECTIONS		30 SEP 2002
178	A31.1	POWER SUBSTATION ROOF PLAN & ELEVS	A	04NOV2002
<u>RANGE 32 – SHOOT HOUSE</u>				
179	A32.1	SMALL AAR	<u>A</u>	<u>15NOV2002</u>
180	A32.2	SHOOT HOUSE ENTRY MODIFICATIONS		30 SEP 2002
<u>DETAILS AND SCHEDULES</u>				
181	A33.1	PROJECT DOOR SCHEDULE I	A	04NOV2002
182	A33.2	PROJECT DOOR SCHEDULE II	A	04NOV2002
183	A33.3	PROJECT DOOR SCHEDULE III	<u>B</u>	<u>15NOV2002</u>
184	A33.4	PROJECT DOOR SCHEDULE IV	A	04NOV2002
185	A33.5	DOOR AND WINDOW DETAILS	<u>A</u>	<u>15NOV2002</u>
186	A35.1	ROOM FINISH SCHEDULE	A	24 OCT 2002
187	A35.2	BUILDING TRIM SCHEDULE	<u>B</u>	<u>15NOV2002</u>
188	A36.1	MISC. DETAILS I	A	08NOV2002
189	A36.2	MISC. DETAILS II	<u>A</u>	<u>15NOV2002</u>
190	A37.1	STAIR DETAILS		30 SEP 2002
191	A37.2	STAIRS AT CHURCH, TOWNHOUSE		30 SEP 2002
192	A37.3	STAIR SECTIONS AT RESIDENCE		30 SEP 2002
193	A37.4	STAIRS AT FARMHOUSE POLICE STATION		30 SEP 2002
194	A38.1	WALL SECTIONS		30 SEP 2002
195	A39.1	AUDIO-VISUAL EQUIPMENT DETAILS	<u>B</u>	<u>15NOV2002</u>

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196	A40.1	LESCHI TOWN SIGNAGE	<u>B</u>	<u>15NOV2002</u>
<u>FIRE PROTECTION</u>				
<u>RANGE 17 – LARGE AAR COMPLEX</u>				
197	FP1.1	FIRE PROTECTION PLAN I CONTROL CENTER BLDG.	<u>A</u>	<u>15NOV2002</u>
198	FP1.2	FIRE PROTECTION PLAN II AAR BLDG.		30 SEP 2002
199	FP1.3	FIRE PROTECTION PLAN III WORKSHOP BLDG.		30 SEP 2002
<u>RANGE 32 – SHOOT HOUSE</u>				
200	FP2.1	FIRE PROTECTION PLAN IV SMALL AAR BLDG.		30 SEP 2002
201	FP3.1	FIRE PROTECTION DETAILS SMALL ARR BLDG.		30 SEP 2002
<u>STRUCTURAL</u>				
202	S0.1	STRUCTURAL NOTES I	A	08NOV2002
203	S0.2	STRUCTURAL NOTES II		30 SEP 2002
<u>RANGE 17 – LARGE AAR COMPLEX</u>				
204	S1.1	AAR BUILDING FOUNDATION PLAN		30 SEP 2002
205	S1.2	CONTROL AREA FOUNDATION PLAN		30 SEP 2002
206	S1.3	WORKSHOP FOUNDATION PLAN		30 SEP 2002
207	S1.4	LATRINE FOUNDATION & ROOF FRAMING PLANS		30 SEP 2002
<u>LESCHI TOWN – FIVE STORY OFFICE BLDG.</u>				
208	S2.1	FOUNDATION PLAN		30 SEP 2002
209	S2.2	SECOND, THIRD, FOURTH, & FIFTH FLOOR FRAMING PLANS		30 SEP 2002
210	S2.3	ROOF FRAMING PLAN		30 SEP 2002

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211	S2.4	SHEARWALL REINFORCEMENT ELEVATIONS I		30 SEP 2002
212	S2.5	SHEARWALL REINFORCEMENT ELEVATIONS II		30 SEP 2002
<u>LESCHI TOWN – RETAIL BUILDING</u>				
213	S3.1	FOUNDATION PLAN		30 SEP 2002
214	S3.2	ROOF FRAMING PLAN		30 SEP 2002
<u>LESCHI TOWN – THREE STORY OFFICE BLDG.</u>				
215	S4.1	FOUNDATION PLAN		30 SEP 2002
216	S4.2	SECOND FLOOR PLAN		30 SEP 2002
217	S4.3	THIRD FLOOR PLAN		30 SEP 2002
218	S4.4	ROOF FRAMING PLAN		30 SEP 2002
<u>LESCHI TOWN – RESIDENTIAL BUILDINGS</u>				
219	S5.1	FOUNDATION AND FRAMING PLANS – TYPE A		30 SEP 2002
220	S5.2	FOUNDATION AND FRAMING PLANS – TYPE B		30 SEP 2002
221	S5.3	FOUNDATION AND FRAMING PLANS – TYPE C		30 SEP 2002
222	S5.4	FOUNDATION AND FRAMING PLANS – TYPE D		30 SEP 2002
223	S5.5	ROOF FRAMING PLANS		30 SEP 2002
<u>LESCHI TOWN - WAREHOUSE</u>				
224	S6.1	WAREHOUSE “A” FOUNDATION PLAN		30 SEP 2002
<u>LESCHI TOWN - TOWNHOUSE</u>				
225	S7.1	BASEMENT, FIRST & SECOND FLOOR FRAMING PLANS		30 SEP 2002

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226	S7.2	ATTIC FLOOR & ROOF FRAMING PLANS	A	25 OCT 2002
<u>LESHI TOWN - HOTEL</u>				
227	S8.1	BASEMENT FLOOR PLAN		30 SEP 2002
228	S8.2	FIRST FLOOR FRAMING PLAN		30 SEP 2002
229	S8.3	SECOND & THIRD FLOOR FRAMING PLANS		30 SEP 2002
230	S8.4	ROOF FRAMING PLAN		30 SEP 2002
<u>LESHI TOWN - SCHOOL</u>				
231	S9.1	FOUNDATION AND SECOND FLOOR PLANS		30 SEP 2002
232	S9.2	ROOF FRAMING PLAN		30 SEP 2002
<u>LESHI TOWN - CHURCH</u>				
233	S10.1	FOUNDATION PLAN		30 SEP 2002
234	S10.2	SECOND FLOOR AND ROOF FRAMING PLANS		30 SEP 2002
235	S10.3	ROOF FRAMING SCHEDULE AND STEEPLE		30 SEP 2002
<u>LESHI TOWN - BANK</u>				
236	S11.1	FOUNDATION AND ROOF FRAMING PLANS		30 SEP 2002
<u>LESHI TOWN – POLICE STATION</u>				
237	S12.1	BASEMENT FLOOR PLAN		30 SEP 2002
238	S12.2	FIRST FLOOR PLAN		30 SEP 2002
239	S12.3	ROOF FRAMING PLAN		30 SEP 2002
<u>LESHI TOWN – SERVICE STATION</u>				
240	S13.1	FOUNDATION AND ROOF FRAMING PLANS		30 SEP 2002

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<u>LESCHI TOWN - CLINIC</u>				
240	S14.1	BASEMENT FLOOR PLAN		30 SEP 2002
242	S14.2	FIRST FLOOR PLAN		30 SEP 2002
243	S14.3	ROOF FRAMING PLAN		30 SEP 2002
<u>LESCHI TOWN – MUNICIPAL BUILDING</u>				
244	S15.1	BASEMENT FLOOR PLAN		30 SEP 2002
245	S15.2	FIRST FLOOR PLAN		30 SEP 2002
246	S15.3	SECOND AND THIRD FLOOR PLANS		30 SEP 2002
247	S15.4	ROOF FRAMING PLAN		30 SEP 2002
248	S15.5	SHEARWALL REINFORCEMENT ELEVATIONS I		30 SEP 2002
249	S15.6	SHEARWALL REINFORCEMENT ELEVATIONS II		30 SEP 2002
<u>LESCHI TOWN – TOWN HALL</u>				
250	S16.1	FOUNDATION PLAN		30 SEP 2002
251	S16.2	SECOND FLOOR AND ROOF FRAMING PLANS		30 SEP 2002
252	S16.3	SHEARWALL REINFORCEMENT ELEVATION		30 SEP 2002
<u>LESCHI TOWN – FIRE STATION</u>				
253	S17.1	FOUNDATION AND ROOF FRAMING PLANS		30 SEP 2002
<u>LESCHI TOWN – POST OFFICE</u>				
254	S18.1	FOUNDATION AND ROOF FRAMING PLANS		30 SEP 2002

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<u>LESCHI TOWN BRIDGES</u>				
255	S19.1	PEDESTRIAN BRIDGE ELEVATION & SECTION	A	08NOV2002
256	S19.2	PEDESTRIAN BRIDGE FENCE DETAILS		30 SEP 2002
257	S19.3	PEDESTRIAN BRIDGE BEARING DETAILS		30 SEP 2002
258	S19.4	CHANNEL BRIDGE PLAN, ELEV. & DETAILS		30 SEP 2002
259	S19.5	CHANNEL BRIDGE ABUTMENT DETAILS	A	24 OCT 2002
<u>RANGE 32 - SHOOTHOUSE</u>				
260	S20.1	FOUNDATION & ROOF FRAMING PLANS	A	24 OCT 2002
261	S20.2	SMALL AAR FOUNDATION PLAN	A	24 OCT 2002
<u>BARRACKS</u>				
262	S21.1	FOUNDATION & ROOF FRAMING PLANS		30 SEP 2002
<u>RADIO STATION BUILDING</u>				
263	S22.1	FOUNDATION & ROOF FRAMING PLANS		30 SEP 2002
<u>FARMHOUSE</u>				
264	S23.1	FOUNDATION, 2 ND FLOOR & ROOF FRAMING PLANS		30 SEP 2002
265	S23.2	BARN FOUNDATION PLAN		30 SEP 2002
<u>MISCELLANEOUS BUILDINGS</u>				
266	S24.1	FOUNDATION & ROOF FRAMING PLANS		30 SEP 2002
267	S24.2	OPEN AIR MARKET FOUNDATION PLAN		30 SEP 2002

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<u>MISCELLANEOUS DETAILS</u>				
268	S25.1	BREACH FACILITY PLATFORM PLAN & ELEVATION		30 SEP 2002
269	S25.2	BREACH FACILITY PLATFORM DETAILS		30 SEP 2002
270	S25.3	BREACH FACILITY DETAILS		30 SEP 2002
<u>FOUNDATION DETAILS</u>				
271	S26.1	FOUNDATION AND SLAB DETAILS		30 SEP 2002
272	S26.2	FOOTING DETAILS I		30 SEP 2002
273	S26.3	FOOTING DETAILS II		30 SEP 2002
274	S26.4	FOOTING DETAILS III		30 SEP 2002
275	S26.5	FOOTING DETAILS IV		30 SEP 2002
276	S26.6	FOOTING DETAILS V		30 SEP 2002
277	S26.7	FOOTING DETAILS VI		30 SEP 2002
<u>MASONRY DETAILS</u>				
278	S27.1	TYPICAL WALL ELEVATIONS		30 SEP 2002
279	S27.2	MASONRY DETAILS		30 SEP 2002
280	S27.3	LINTEL DETAILS		30 SEP 2002
281	S27.4	SHEAR STEEL DETAILS		30 SEP 2002
282	S27.5	WALL SECTIONS & DETAILS I		30 SEP 2002
283	S27.6	WALL SECTIONS & DETAILS II		30 SEP 2002
284	S27.7	PARTITION WALL SECTIONS		30 SEP 2002
<u>FRAMING DETAILS</u>				
285	S28.1	HOLLOW CORE SLAB DETAILS		30 SEP 2002
286	S28.2	TOPPING SLAB DETAILS		30 SEP 2002

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287	S28.3	STEEL FRAMING DETAILS I		30 SEP 2002
288	S28.4	STEEL FRAMING DETAILS II		30 SEP 2002
289	S28.5	STEEL FRAMING DETAILS III		30 SEP 2002
290	S28.6	STEEL FRAMING DETAILS IV		30 SEP 2002
291	S28.7	STEEL FRAMING DETAILS V		30 SEP 2002
292	S28.8	STEEL FRAMING DETAILS VI		30 SEP 2002
293	S28.9	STEEL FRAMING DETAILS VII		30 SEP 2002
294	S28.10	WOOD FRAMING DETAILS		30 SEP 2002
295	S28.11	STAIR & GUARDRAIL SECTION & DETAILS I		30 SEP 2002
296	S28.12	STAIR & GUARDRAIL SECTION & DETAILS II		30 SEP 2002
297	S28.13	STAIR & GUARDRAIL SECTION & DETAILS III	A	28 OCT 2002
<u>SCHEDULES</u>				
298	S30.1	MASONRY SCHEDULE		30 SEP 2002
<u>LESCHI TOWN DOCKS</u>				
299	S31.1	TYPICAL RAMP DETAILS		30 SEP 2002
300	S31.2	RAIL HEAD RAMP DETAILS II		30 SEP 2002
301	S31.3	TRUCK RAMP DETAILS		30 SEP 2002
<u>LESCHI TOWN</u>				
302	S32.1	MOCK RADIO STATION TOWER FOUNDATION ELEVATION AND DETAILS		30 SEP 2002
<u>MECHANICAL</u>				
303	M0.1	MECHANICAL LEGEND & ABBREVIATIONS		30 SEP 2002

SHEET NUMBER	PLATE NUMBER	TITLE	REVISION NUMBER	DATE
304	M0.2	EQUIPMENT SCHEDULES		30 SEP 2002
<u>RANGE 17 LARGE AAR</u>				
305	M1.1	CONTROL CENTER HVAC FLOOR PLAN		30 SEP 2002
306	M1.2	AAR BUILDING HVAC FLOOR PLAN		30 SEP 2002
307	M1.3	WORKSHOP HVAC FLOOR PLAN		30 SEP 2002
308	M1.4	LATRINE HVAC FLOOR PLAN		30 SEP 2002
309	M1.5	PUMPHOUSE HVAC FLOOR PLAN		30 SEP 2002
310	M1.6	PUMPHOUSE SCHEMATIC		30 SEP 2002
311	M1.7	HVAC CONTROLS		30 SEP 2002
312	M1.8	CONTROL CENTER PLUMBING FLOOR PLAN		30 SEP 2002
313	M1.9	WORKSHOP PLUMBING FLOOR PLAN		30 SEP 2002
<u>LESCHI TOWN</u>				
314	M2.1	UNDERGROUND TRAINER VENTILATION DETAILS		30 SEP 2002
315	M2.	SCHOOL & CLINIC HVAC PLAN		30 SEP 2002
316	M2.3	SCHOOL PLUMBING FLOOR PLAN		30 SEP 2002
317	M2.4	CLINIC PLUMBING FLOOR PLAN		30 SEP 2002
318	M2.5	PUMPHOUSE MECH PLAN		30 SEP 2002
319	M2.6	PUMPHOUSE SCHEMATIC		30 SEP 2002
<u>RANGE 32 SHOOT HOUSE</u>				
320	M3.1	SMALL AAR HVAC PLAN AND CONTROL		30 SEP 2002
321	M4.1	DETAILS I		30 SEP 2002
322	M4.2	DETAILS II		30 SEP 2002
<u>ELECTRICAL</u>				

SHEET NUMBER	PLATE NUMBER	TITLE	REVISION NUMBER	DATE
323	E0.1	LEGENDS		30 SEP 2002
324	E0.2	SITE PLAN SOUTH		30 SEP 2002
325	E0.3	SITE PLAN NORTH		30 SEP 2002
326	E0.4	LESCHI SITE PLAN 1		30 SEP 2002
327	E0.5	LESCHI SITE PLAN 2		30 SEP 2002
328	E0.6	LESCHI SITE PLAN 3		30 SEP 2002
329	E0.7	LESCHI SITE PLAN 4		30 SEP 2002
330	E0.8	LESCHI SITE PLAN 5		30 SEP 2002
331	E0.9	LESCHI SITE PLAN 6		30 SEP 2002
332	E0.10	LESCHI SITE PLAN 7		30 SEP 2002
333	E0.11	LESCHI SITE PLAN 8		30 SEP 2002
334	E0.12	LESCHI SITE PLAN 9		30 SEP 2002
335	E0.13	LESCHI SITE PLAN 10		30 SEP 2002
<u>RANGE 17 – LARGE AAR COMPLEX</u>				
336	E1.1	AAR SITE PLAN		30 SEP 2002
337	E1.2	AAR CONTROL CENTER		30 SEP 2002
338	E1.3	AAR BUILDING		30 SEP 2002
339	E1.4	AAR WORKSHOP		30 SEP 2002
340	E1.5	AAR LATRINE		30 SEP 2002
341	E1.6	PUMPHOUSE		30 SEP 2002
342	E1.7	ONE-LINES		30 SEP 2002
343	E1.8	COMMUNICATIONS HUT		30 SEP 2002
<u>LESCHI TOWN</u>				
344	E2.1	5-STORY OFFICE BLDG.		30 SEP 2002

SHEET NUMBER	PLATE NUMBER	TITLE	REVISION NUMBER	DATE
345	E2.2	5-STORY OFFICE BLDG.		30 SEP 2002
346	E2.3	5-STORY OFFICE BLDG.		30 SEP 2002
347	E2.4	5-STORY OFFICE BLDG.		30 SEP 2002
348	E2.5	5-STORY OFFICE BLDG.		30 SEP 2002
349	E3.1	RETAIL STORE – A		30 SEP 2002
350	E4.1	3-STORY OFFICE BLDG.		30 SEP 2002
351	E4.2	3-STORY OFFICE BLDG.		30 SEP 2002
352	E4.3	3-STORY OFFICE BLDG.		30 SEP 2002
353	E5.1	RESIDENTIAL – TYPE A		30 SEP 2002
354	E5.2	RESIDENTIAL – TYPE B		30 SEP 2002
355	E5.3	RESIDENTIAL – TYPE C		30 SEP 2002
356	E5.4	RESIDENTIAL – TYPE D		30 SEP 2002
357	E6.1	WAREHOUSE –A		30 SEP 2002
358	E7.1	TOWNHOUSE		30 SEP 2002
359	E7.2	TOWNHOUSE		30 SEP 2002
360	E7.3	TOWNHOUSE		30 SEP 2002
361	E8.1	HOTEL		30 SEP 2002
362	E8.2	HOTEL		30 SEP 2002
363	E8.3	HOTEL		30 SEP 2002
364	E8.4	HOTEL		30 SEP 2002
365	E8.5	HOTEL		30 SEP 2002
366	E8.6	OPEN-AIR MARKET		30 SEP 2002
367	E9.1	SCHOOL		30 SEP 2002
368	E9.2	SCHOOL		30 SEP 2002

SHEET NUMBER	PLATE NUMBER	TITLE	REVISION NUMBER	DATE
369	E10.1	CHURCH		30 SEP 2002
370	E10.2	CHURCH		30 SEP 2002
371	E11.1	BANK		30 SEP 2002
372	E12.1	POLICE STATION		30 SEP 2002
373	E12.2	POLICE STATION		30 SEP 2002
374	E13.1	SERVICE STATION		30 SEP 2002
375	E14.1	CLINIC		30 SEP 2002
376	E14.2	CLINIC		30 SEP 2002
377	E15.1	PUMPHOUSE		30 SEP 2002
378	E16.1	MUNICIPAL BLDG.		30 SEP 2002
379	E16.2	MUNICIPAL BLDG.		30 SEP 2002
380	E16.3	MUNICIPAL BLDG.		30 SEP 2002
381	E16.4	MUNICIPAL BLDG.		30 SEP 2002
382	E17.1	TOWN HALL		30 SEP 2002
383	E17.2	TOWN HALL		30 SEP 2002
384	E18.1	FIRE STATION		30 SEP 2002
385	E19.1	POST OFFICE		30 SEP 2002
386	E20.1	POWER SUBSTATION		30 SEP 2002
387	E21.1	RETAIL STORE – B		30 SEP 2002
388	E22.1	RADIO STATION		30 SEP 2002
389	E23.1	JUNK YARD GUARD SHACK		30 SEP 2002
390	E24.1	FUEL STATION ATTENDANT BLDG.		30 SEP 2002
391	E25.1	WAREHOUSE – B		30 SEP 2002

GARRISON AREA

SHEET NUMBER	PLATE NUMBER	TITLE	REVISION NUMBER	DATE
392	E26.1	BARRACKS		30 SEP 2002
393	E27.1	HEADQUARTERS		30 SEP 2002
394	E28.1	SHOWER/LATRINE		30 SEP 2002
395	E29.1	MESS & SUPPLY		30 SEP 2002
<u>FARM</u>				
396	E30.1	FARMHOUSE		30 SEP 2002
397	E31.1	BARN		30 SEP 2002
398	E32.1	CHICKEN HOUSE		30 SEP 2002
399	E33.1	ROOT CELLAR/STORAGE SHACK		30 SEP 2002
<u>RANGE 32 - SHOOTHOUSE</u>				
400	E34.1	RANGE 32 SITE PLAN		30 SEP 2002
401	E34.2	SHOOTHOUSE MODIFICATIONS		30 SEP 2002
402	E34.3	SMALL AAR POWER		30 SEP 2002
403	E34.4	SMALL AAR LIGHTING		30 SEP 2002
<u>DETAILS & SCHEDULES</u>				
404	E35.1	DETAILS 1 TRANSFORMER INSTALLATION		30 SEP 2002
405	E35.2	DETAILS 2 INSTRUMENTATION WIRING		30 SEP 2002
406	E35.3	DETAILS 3 DUCT BANK SCHEDULE		30 SEP 2002
407	E35.4	DETAILS 4 POLE RISER		30 SEP 2002
408	E35.5	DETAILS 5 EXTERIOR CCTV INSTALLATION		30 SEP 2002
409	E35.6	DETAILS 6 LIGHTING FIXTURES		30 SEP 2002
410	E35.7	DETAILS 7 COMMUNICATIONS MANHOLE		30 SEP 2002
411	E35.8	DETAILS 8 CATHODIC PROTECTION 1		30 SEP 2002

SHEET NUMBER	PLATE NUMBER	TITLE	REVISION NUMBER	DATE
412	E35.9	DETAILS 9 CATHODIC PROTECTION 2		30 SEP 2002
413	E35.10	DETAILS 10 FIRE DETECTION & ALARM		30 SEP 2002
414	E35.11	DETAILS 11 LOW VOLTAGE LIGHTING CONTROL		30 SEP 2002
415	E35.12	DETAILS 12 POWER MANHOLE		30 SEP 2002
416	E35.13	DETAILS 13 FLOURESCENT FIXTURES		30 SEP 2002
417	E35.14	DETAILS 14 HELIPAD LIGHTS		30 SEP 2002
418	E35.15	DETAILS 15 TELEPHONE		30 SEP 2002
419	E35.16	DETAILS 16 EXTERIOR COMPONENTS		30 SEP 2002
420	E35.17	LESCHI TOWN ONE-LINE		30 SEP 2002

SCHEDULES

421	E36.1	PANEL SCHEDULES		30 SEP 2002
422	E36.2	PANEL SCHEDULES		30 SEP 2002
423	E36.3	PANEL SCHEDULES		30 SEP 2002
424	E36.4	PANEL SCHEDULES		30 SEP 2002

REVISIONS TO DRAWINGS BY NOTATION

Drawing Sheet C0.1: Revise as shown on Sketch C-11, attached to the end of the Special Clauses.

Drawing Sheet C2.3: Add third sentence to Note 4, to read, "No curb and gutter is required around AC at Helipad." Add second and third sentence to Note 7, to read, "Concrete Section for Helipad shall be as shown on Plate 6.3 for Typical PCC Turning Pad. Joint between AC and concrete shall be as shown for Junction Between AC and PCC Turning Pad shown on Plate C6.3."

Drawing Sheet C2.4: Revise as shown on Sketches C-1 and C-10, attached to the end of the Special Clauses.

Drawing Sheet C2.7: Add Note 8, to read, "Concrete curb and gutter and sidewalk at driveways within Sua Sponte Circle shall use Typical Low Profile Curb Detail (Elevation) at driveways, except that the 600 mm dimension shall be increased to 3 M. See Plate C6.12" Add Note 9, to read, "AC driveways to residences within Sua Sponte Circle shall not be bound by curb and gutter." Add Note 10, to read, "Retaining walls along driveway at Residence Type A shall be 7.5 M long, measured from the outside face of the building."

Drawing Sheet C2.7: Revise as shown on Sketches C-2, C-3 and C-4, attached to the end of the Special Clauses.

Drawing Sheet C2.10: Revise as shown on Sketch C-5, attached to the end of the Special Clauses.

Drawing Sheet C4.2: Add Note 4, to read, “Contractor shall stake fence alignment and de-brush the alignment as required to allow 3 meters clear from outside of fence to nearest obstacle that would prohibit vehicle access. Contractor shall mark trees classified as salable timber within the limits stated above. The Government will remove the trees classifies salable timber. The Government will have 180 days from notification by the Contractor that the trees have been marked for removal to remove the trees. The Contractor shall remove all stumps to be flush with surrounding ground surface.”

Drawing Sheet C6.5: Add Note 5, to read, “If the options to construct PCC turning pads are not awarded, PCC turning pads shall be constructed according to Gravel Surfacing Section Detail on Sheet C6.3.”

Drawing Sheet C6.6: Add Note 5, to read, “If the options to construct PCC turning pads are not awarded, PCC turning pads shall be constructed according to Gravel Surfacing Section Detail on Sheet C6.3.” Beneath Joint Layout Detail J, add “NOTE: PCC turning pad for Joint Layout Detail J is Base Bid work.”

Drawing Sheet C6.8: Revise as shown on Sketches C-6 and C-7, attached to the end of the Special Clauses. Add “1830 mm Diameter Manhole” detail as shown on Sketch C-12, attached to the end of the Special Clauses.

Drawing Sheet C6.10: Revise as shown on Sketches C-8 and C-9, attached to the end of the Special Clauses.

Drawing Sheet C6.14: Add Note 4, to read, “In lieu of Cast-In-Place Conc. Cap, the Contactor may propose a Pre-Cast Conc. Cap meeting all requirements of the Cast-In-Place Conc. Cap.”

Drawing, Sheet S0.1: Revise Note IV.C.6 to read, “The length to width ratio of single slab pours is not to exceed 1.5 intermediate sawcut, control joints to be made within 24 hours of slab pours. Slab joints to be located and spaced as shown on the drawings. Use 50 to 100mm trimmable compactable fill per ACI 302.1 over a 6-8 mil vapor barrier over a 150mm capillary water barrier for occupied buildings at Range 17 and 32. Other non-occupied buildings require only a capillary water barrier (no trimmable fill or vapor barrier). See specifications for additional requirements.”

Drawing, Sheet S5.1: Revise Note 5 to read, “See architectural sheets for masonry partition wall (MPW) locations, and Sheet S27.2 for details.” Add Note 8, to read, “See Sheet A37.2 for residential stair details.”

Drawing, Sheet S5.2: Add Note 8, to read, “See Sheet A37.2 for residential stair details.”

Drawing, Sheet S7.2: Change section bubble 4/S28.3 to 4/S28.5, two places. Change section bubble 5/S28.3 to 5/S28.5, two places.

Drawing, Sheet S19.1: Add the following note to TYPICAL SECTION THRU BRIDGE: “At the option of the Contractor, a 130 mm (total thickness) pretopped deck may be used in lieu of a 65 mm cast-in-place concrete topping slab. The top of deck elevation shall remain the same.

Drawing, Sheet S19.3: Expansion Joint Details – delete the note beneath the title.

Drawing, Sheet S26.1: In Typical Slab (Control Joints) section, change welded wire fabric to 152x152 – MW13xMW13.

Drawing Sheet M0.2: In the Fan Schedule, Mark EF-12; revise airflow (L/s) from 100 to 500, weight (kg) from 7.25 to 9, RPM from 1100 to 1550 and kW from 0.03 to 0.1.

Drawing Sheet M2.2: In the Diffuser/Register/Grille Schedule, Mark RG-12; revise airflow range (L/s) from 82/114 to 500, and diffuser size (mm X mm) from 355 X 203 to 515 X 515.

Drawing Sheet E0.10: Add General Note and sign detail as shown on Sketch E-3, attached to the end of the Special Clauses.

Drawing Sheet E1.4: Change panel AC from 36 circuits to 42 circuits. Add 3 2-pole, 35-amp, circuit breakers at circuit positions 28-30, 32-34, and 36-38.

Drawing Sheet E1.4: For the Workshop, add 3 equipment connections for roll-up door motors and controls for doors 102B, 102C, and 102D. Provide (3) 3 #12 AWG in 21 mm conduits to each door equipment connection. Coordinate with roll-up door specific electrical requirements.

Drawing Sheet E1.8: Add Note 6, to read, "Lighting fixtures indicated shall be type PF2 -- 2-lamp, 1.2-meter, fluorescent wraparound."

Drawing Sheet E4.3: Delete microphone from Kitchen, Room 304.

Drawing Sheet E9.2: Revise Second Floor Plan as shown on Sketch E-2, attached to the end of the Special Clauses.

Drawing Sheet E13.1: Provide a panic button at the main entrance to the service station.

Drawing Sheet E33.1: Provide a panic button by the basement entrance to the root cellar, and at the storage shack ground floor entrance.

Drawing Sheet E34.2: Add Note 3, to read, "Attach all shoothouse raceways to roof structure, not to shoothouse wall, except for the vertical runs. Provide flexible conduit between top of vertical runs and the wireway."

Drawing Sheet E35.1: Add a note to detail "A" TRANSFORMER PAD ON VAULT as follows: "3. The size of the vaults for Leschi Town may be reduced as long as the cable manufacturer's bending radii criteria are not exceeded."

Drawing Sheet E35.2: Revise Camera Outlet detail and camera definition as shown on Sketch E-1, attached to the end of the Special Clauses.

Drawing Sheet E35.3: In Section B-B, change the 50 mm dimension between the communication conduit and the power conduit to 300 mm.

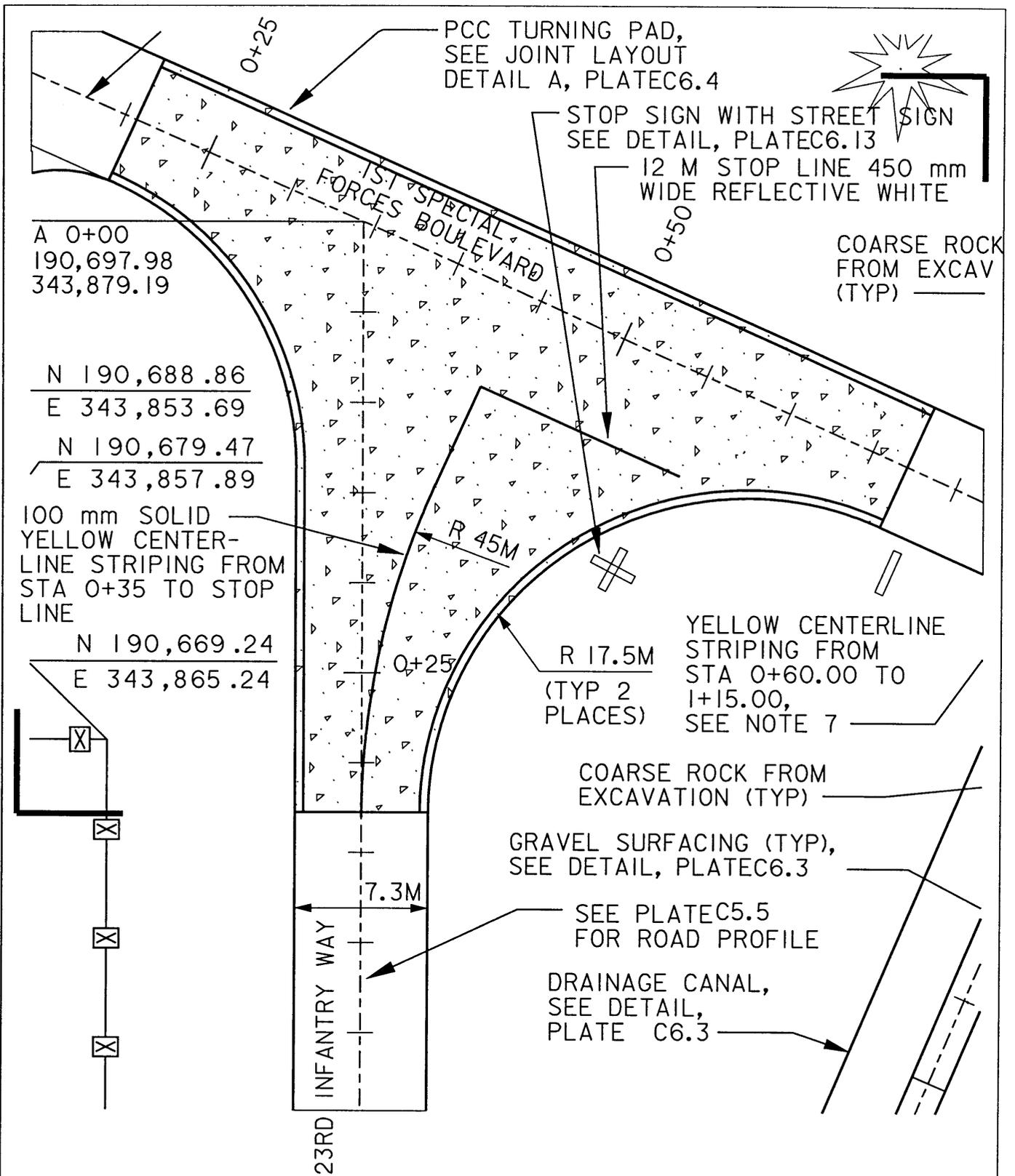
Drawing Sheet E35.17: Change Transformer T9 from 37.5 KVA to 100 KVA.

STANDARD DETAILS BOUND IN THE SPECIFICATIONS

DRAWING NUMBER	SHEET NUMBER	TITLE	DATE
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SECTION 01501 - CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

1 & 2	U.S. Army Project Construction Sign	84JUN20
1	Hard Hat Sign	10SEP90

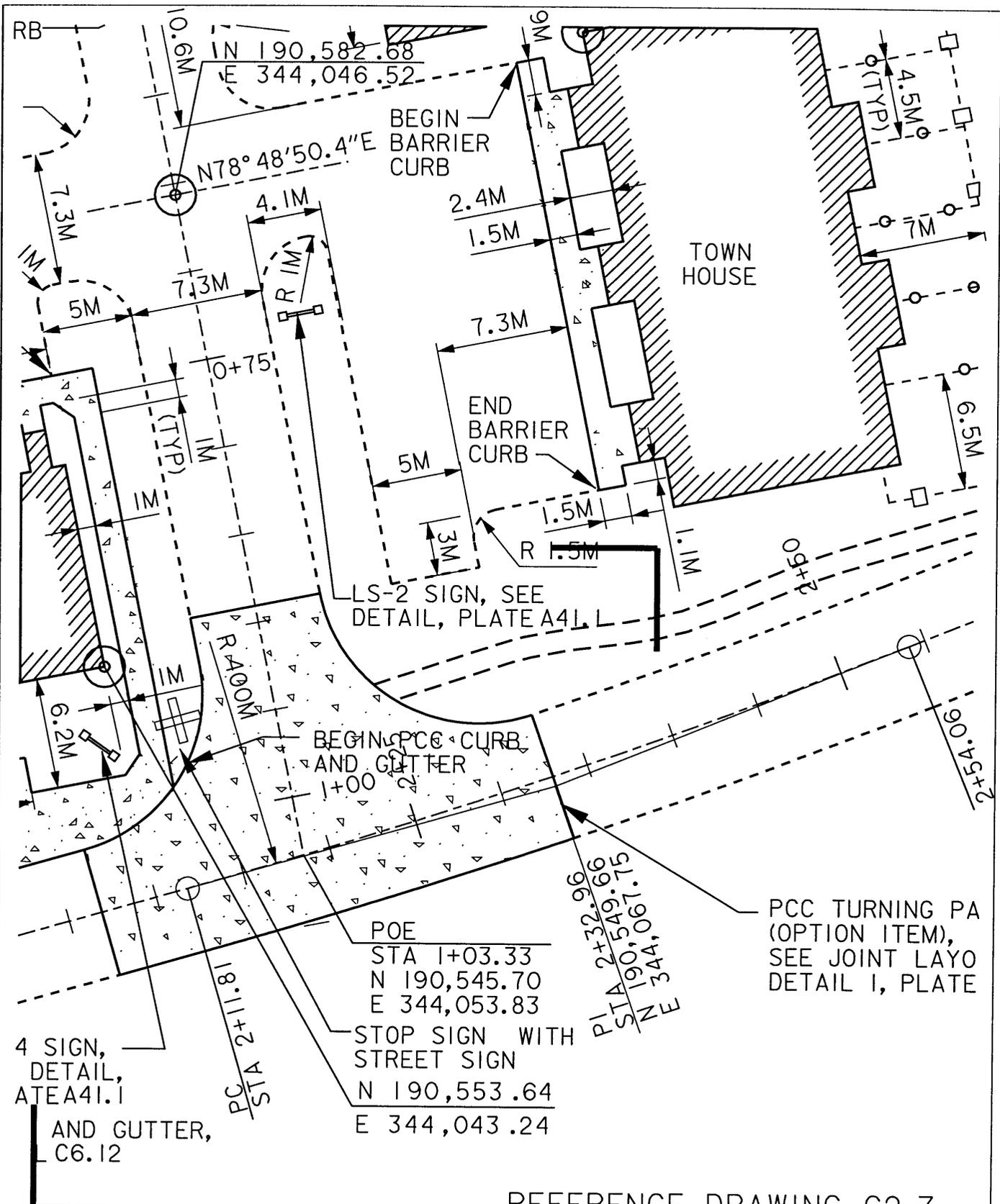


REFERENCE DRAWING C2.4

U.S. ARMY ENGINEER DISTRICT, SEATTLE CORPS OF ENGINEERS SEATTLE, WASHINGTON	Date: 28 OCT 02
	File # 22s/171-90-11
COMBINED ARMS COLLECTIVE TRAINING FACILITY FORT LEWIS WASHINGTON	PROJECT # PN 13643
	Designed by: GOUGH

SKETCH
NUMBER:

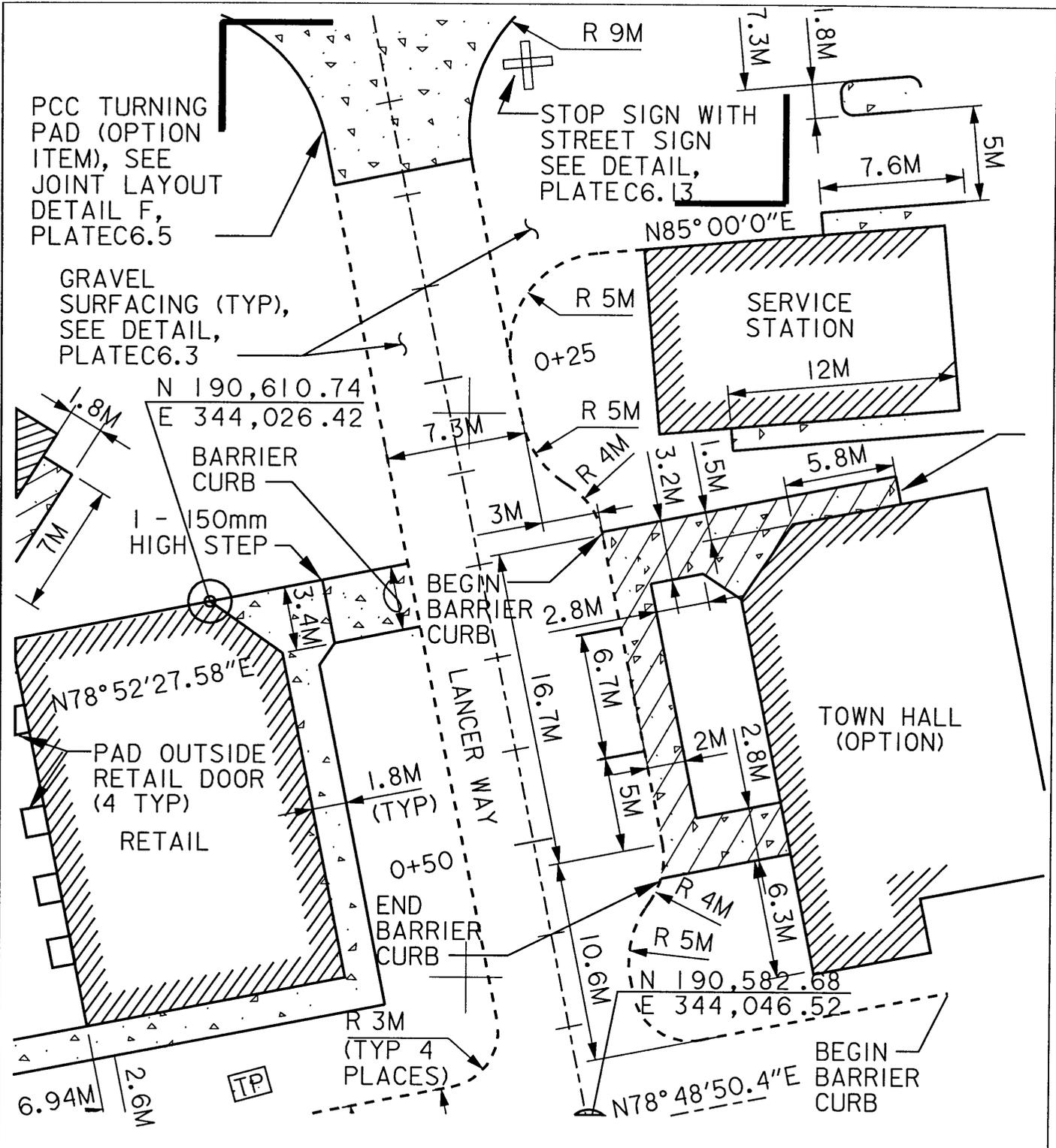
C-1



REFERENCE DRAWING C2.7

U.S. ARMY ENGINEER DISTRICT, SEATTLE CORPS OF ENGINEERS SEATTLE, WASHINGTON	Date: 28 OCT 02
	File # 22s/171-90-11
COMBINED ARMS COLLECTIVE TRAINING FACILITY FORT LEWIS WASHINGTON	PROJECT # PN 13643
	Designed by: GOUGH

SKETCH
 NUMBER:
 C-2

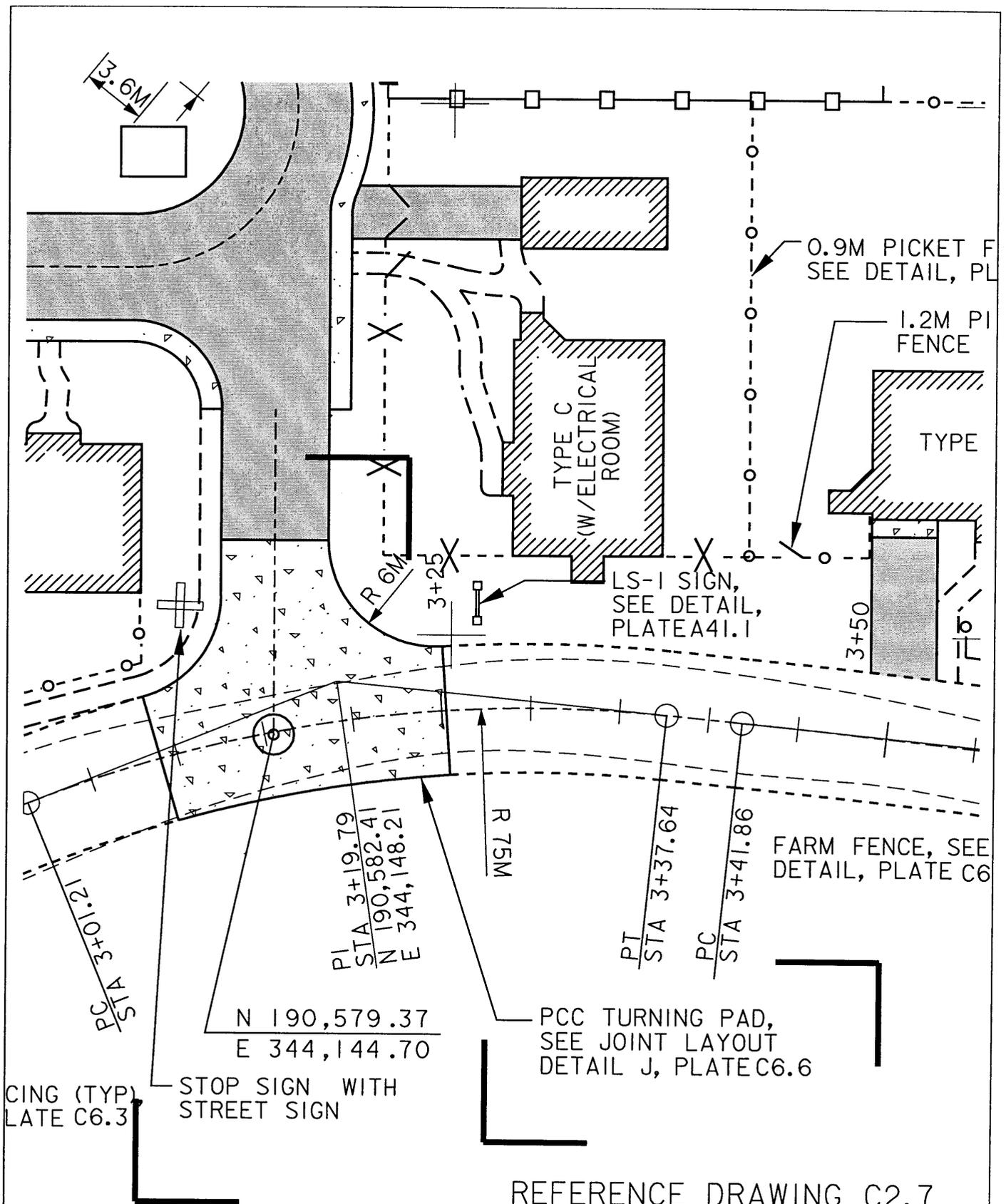


REFERENCE DRAWING C2.7

<p>U.S. ARMY ENGINEER DISTRICT, SEATTLE CORPS OF ENGINEERS SEATTLE, WASHINGTON</p>	<p>Date: 28 OCT 02</p>
	<p>File # 22s/171-90-11</p>
<p>COMBINED ARMS COLLECTIVE TRAINING FACILITY</p>	<p>PROJECT # PN 13643</p>
	<p>Designed by: GOUGH</p>
<p>FORT LEWIS WASHINGTON</p>	

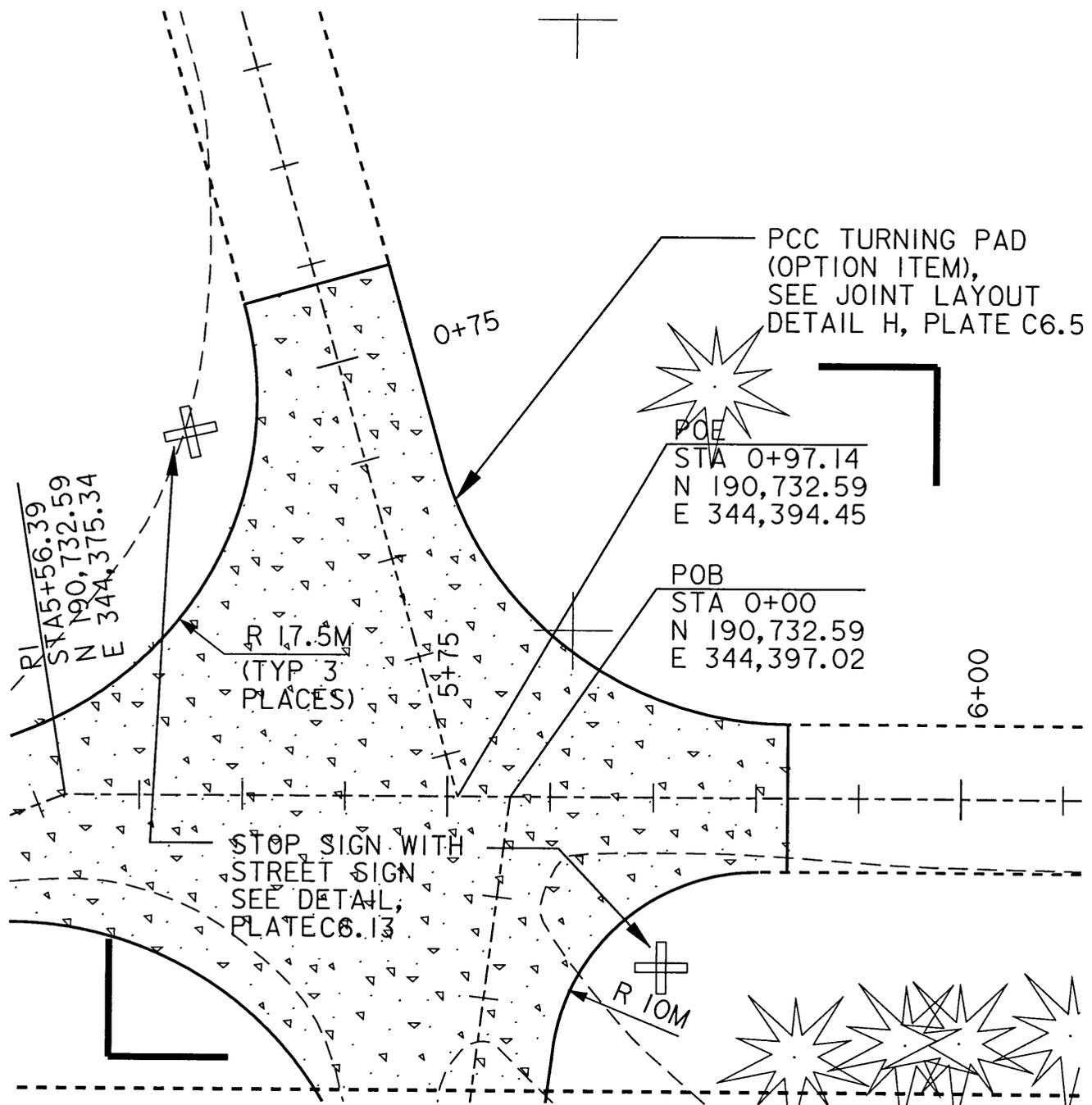
SKETCH
NUMBER:

C-3



REFERENCE DRAWING C2.7

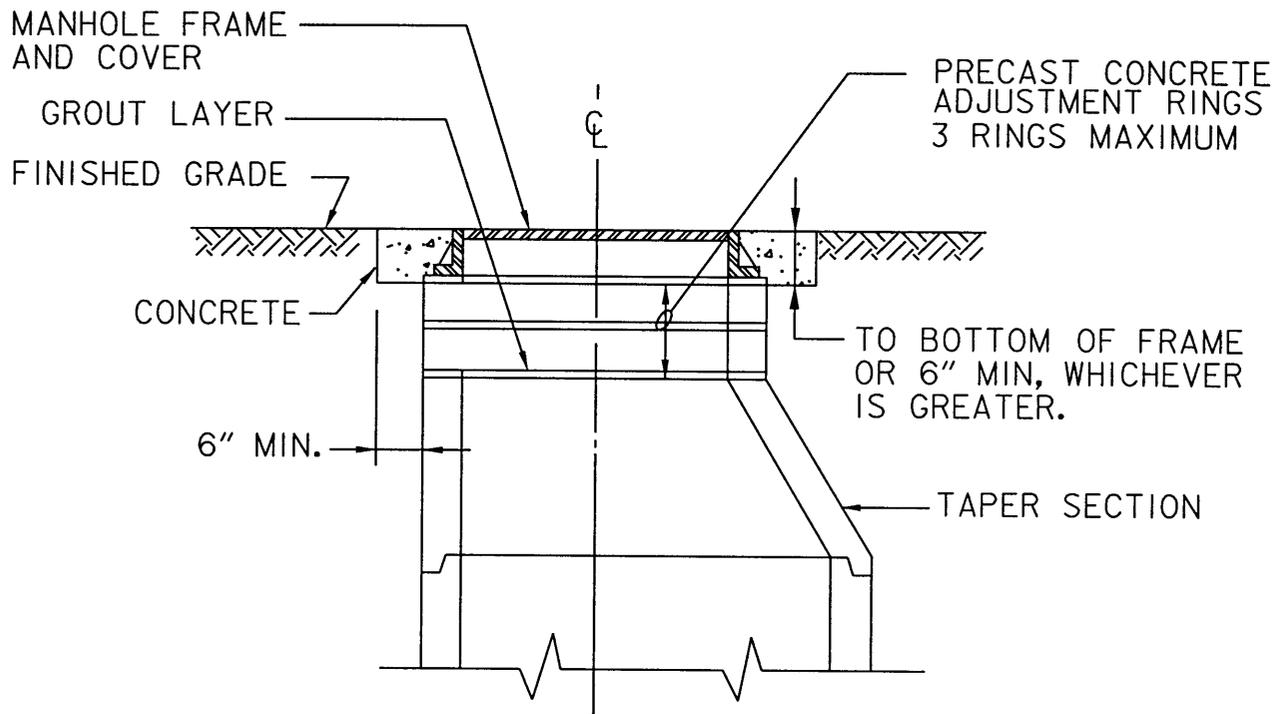
U.S. ARMY ENGINEER DISTRICT, SEATTLE CORPS OF ENGINEERS SEATTLE, WASHINGTON	Date: 28 OCT 02	SKETCH NUMBER: C-4
	File # 22s/171-90-11	
COMBINED ARMS COLLECTIVE TRAINING FACILITY	PROJECT # PN 13643	
FORT LEWIS WASHINGTON	Designed by: GOUGH	



REFERENCE DRAWING C2.10

U.S. ARMY ENGINEER DISTRICT, SEATTLE CORPS OF ENGINEERS SEATTLE, WASHINGTON	Date: 28 OCT 02
	File # 22s/171-90-11
COMBINED ARMS COLLECTIVE TRAINING FACILITY FORT LEWIS WASHINGTON	PROJECT # PN 13643
	Designed by: GOUGH

SKETCH
 NUMBER:
 C-5



CONCRETE COLLAR DETAIL

NOTE:

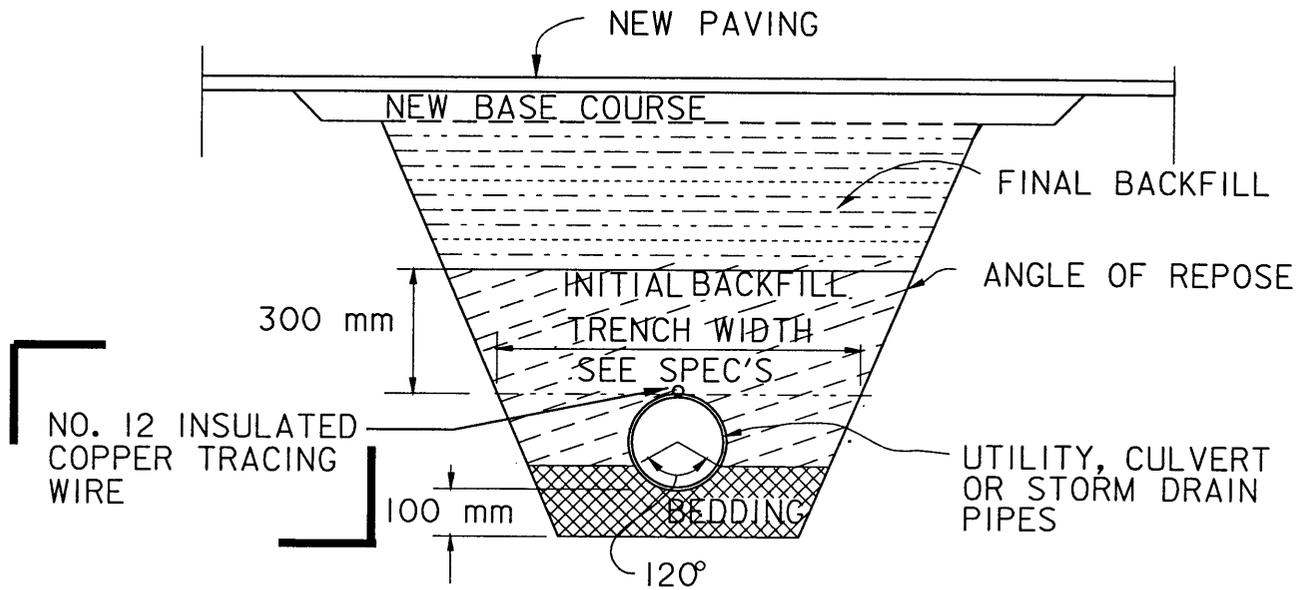
CONSTRUCT CONCRETE COLLARS AROUND ALL MANHOLE, SEPTIC TANK ACCESS, PUMP CHAMBER ACCESS AND CATCH BASIN FRAMES LOCATED IN AREAS OUTSIDE OF AC PAVEMENT AND PCC PAVEMENT.

REFERENCE DRAWING C6.8

U.S. ARMY ENGINEER DISTRICT, SEATTLE CORPS OF ENGINEERS SEATTLE, WASHINGTON	Date: 28 OCT 02
	File # 22s/171-90-11
COMBINED ARMS COLLECTIVE TRAINING FACILITY FORT LEWIS WASHINGTON	PROJECT # PN 13643
	Designed by: GOUGH

SKETCH
NUMBER:

C-6



TYPICAL PIPE LAYING TRENCH DETAIL
FOR UTILITY, CULVERT OR STORM
DRAIN PIPES

UTILITY TRENCH AND BACKFILL DETAIL

NOT TO SCALE

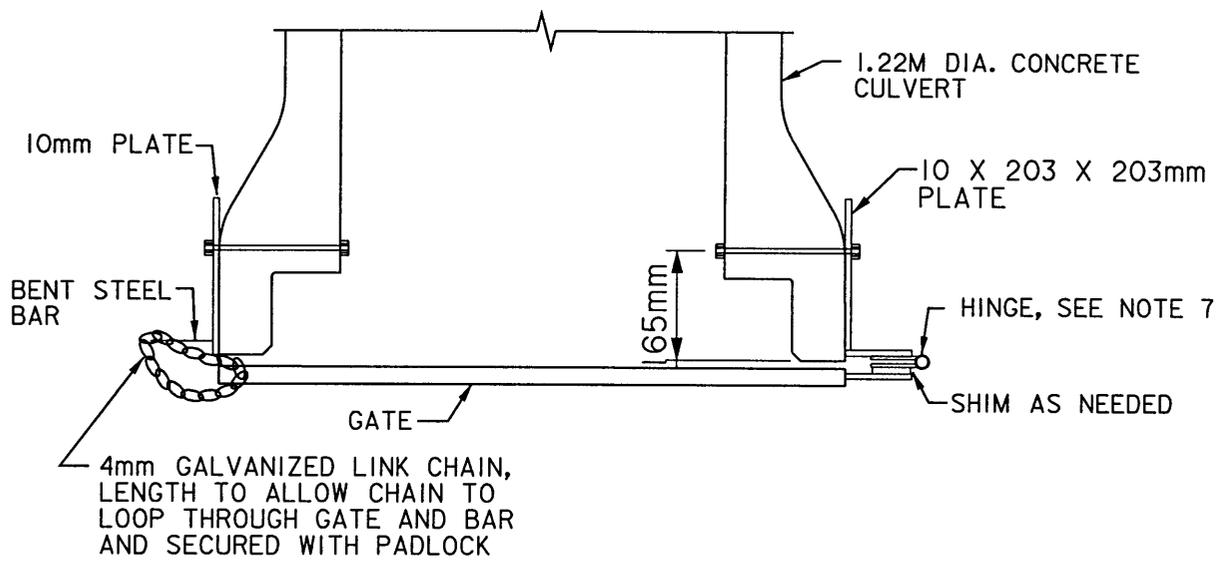
NOTE:

COPPER TRACING WIRE TO BE PROVIDED
ON ALL NON-METALIC WATER LINES, SANITARY
SEWER LINES AND STORM DRAIN LINES

REFERENCE DRAWING C6.8

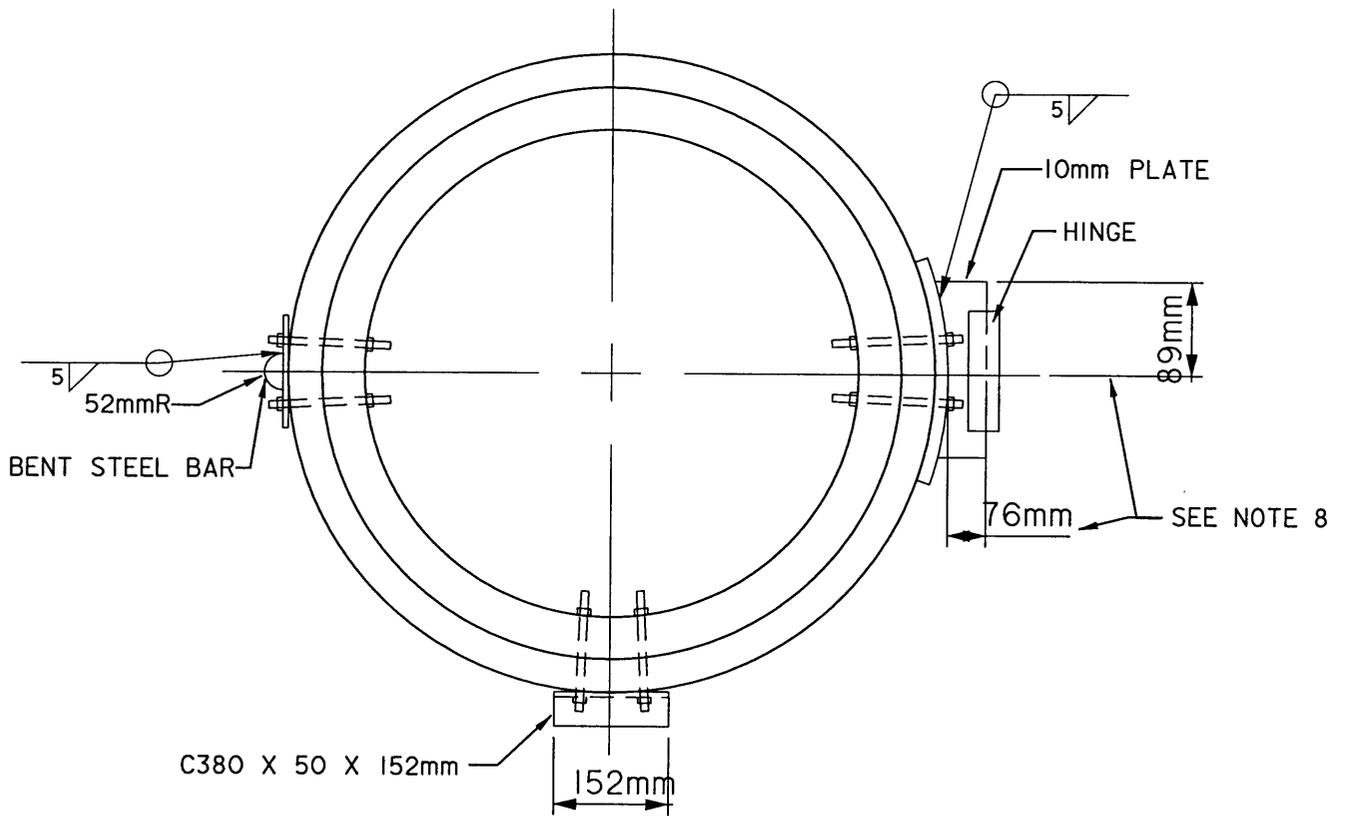
U.S. ARMY ENGINEER DISTRICT, SEATTLE CORPS OF ENGINEERS SEATTLE, WASHINGTON	Date: 28 OCT 02
	File # 22s/171-90-11
COMBINED ARMS COLLECTIVE TRAINING FACILITY FORT LEWIS WASHINGTON	PROJECT # PN 13643
	Designed by: GOUGH

SKETCH NUMBER: C-7



PLAN

NOT TO SCALE



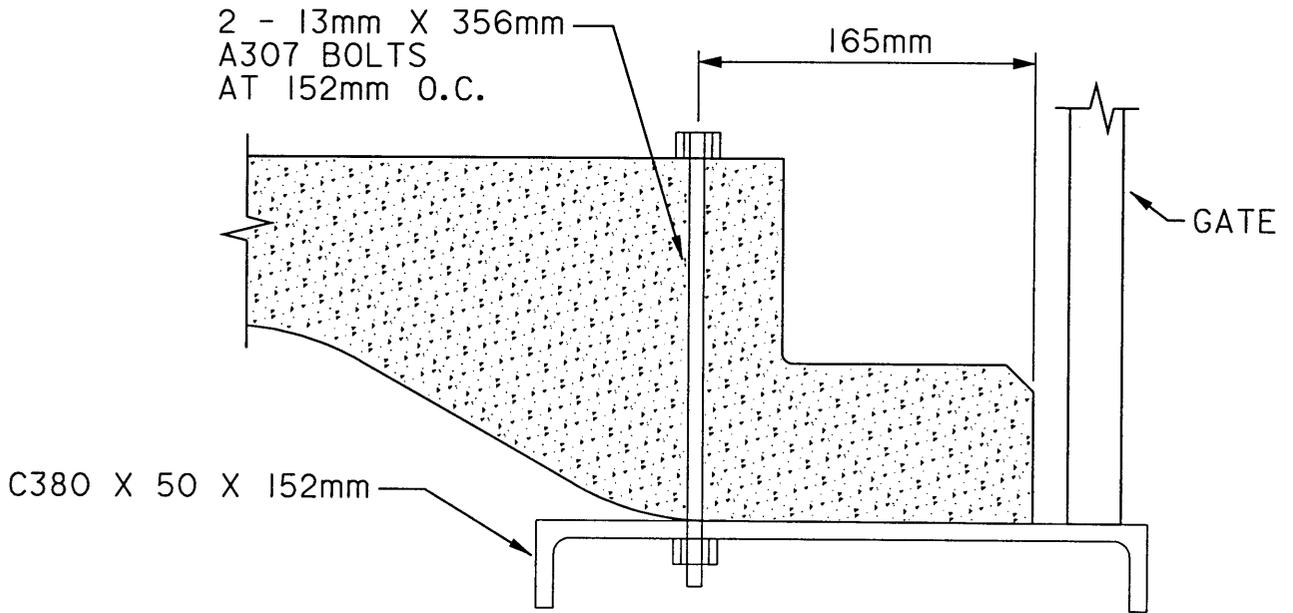
CULVERT ELEVATION

NOT TO SCALE

REFERENCE DRAWING C6.10

U.S. ARMY ENGINEER DISTRICT, SEATTLE CORPS OF ENGINEERS SEATTLE, WASHINGTON	Date: 28 OCT 02
	File # 22s/171-90-11
COMBINED ARMS COLLECTIVE TRAINING FACILITY FORT LEWIS WASHINGTON	PROJECT # PN 13643
	Designed by: GOUGH

SKETCH NUMBER: C-8



SECTION A - A

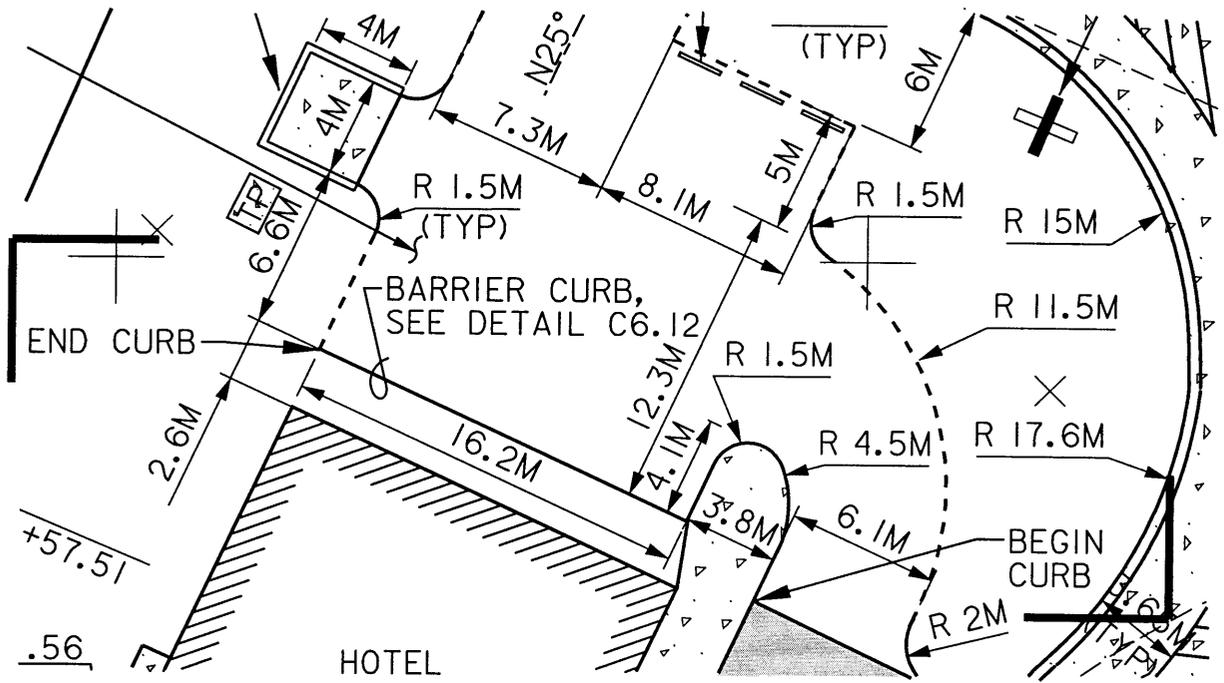
NOT TO SCALE

REFERENCE DRAWING C6.10

U.S. ARMY ENGINEER DISTRICT, SEATTLE CORPS OF ENGINEERS SEATTLE, WASHINGTON	Date: 28 OCT 02
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COMBINED ARMS COLLECTIVE TRAINING FACILITY FORT LEWIS WASHINGTON	PROJECT # PN 13643
	Designed by: GOUGH

SKETCH
NUMBER:

C-9



REFERENCE DRAWING C2.4

U.S. ARMY ENGINEER DISTRICT, SEATTLE CORPS OF ENGINEERS SEATTLE, WASHINGTON	Date: 28 OCT 02
	File # 22s/171-90-11
COMBINED ARMS COLLECTIVE TRAINING FACILITY FORT LEWIS WASHINGTON	PROJECT # PN 13643
	Designed by: GOUGH

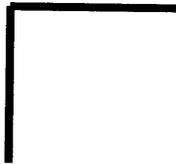
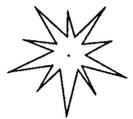
SKETCH
NUMBER:

C-10

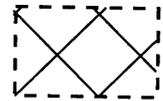


VEGETATION

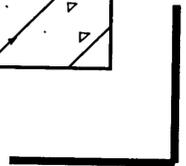
TREES, REMAIN



OPTIONAL ITEM GRAVEL
SURFACING (TYP)



OPTIONAL ITEM
PCC

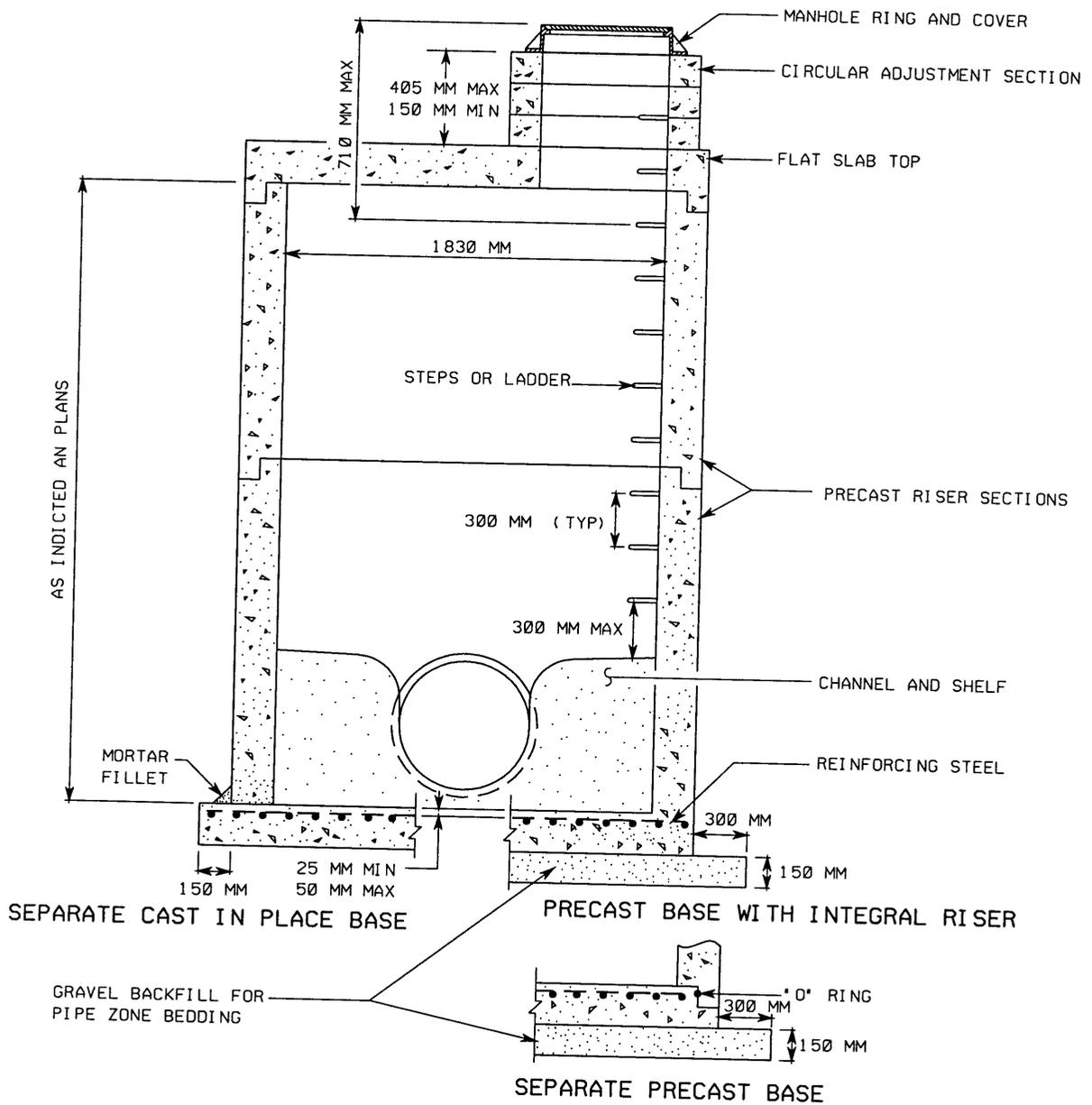


REFERENCE DRAWING CO.1

U.S. ARMY ENGINEER DISTRICT, SEATTLE CORPS OF ENGINEERS SEATTLE, WASHINGTON	Date: 28 OCT 02
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	Designed by: GOUGH

SKETCH
NUMBER:

C-11



MANHOLE DIMENSION TABLE						
DIA	WALL THICKNESS	BASE THICKNESS	MAXIMUM KNOCKOUT SIZE	MINIMUM DISTANCE BETWEEN KNOCKOUTS	BASE REINFORCING STEEL MM/M IN EACH DIRECTION	
					INTEGRAL BASE	SEPARATE BASE
1830	150	200	1525	300	508	740

NOTES

1. ALL MANHOLES THAT CONNECT WITH 1220 MM STORM DRAIN LINE SHALL USE 1830 MM DIAMETER MANHOLE.
2. KNOCKOUTS SHALL HAVE A WALL THICKNESS OF 50MM MINIMUM TO 60 MM MAXIMUM.

1830 mm DIAMETER MANHOLE

NOT TO SCALE

REFERENCE DRAWING C6.8

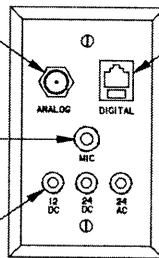
U.S. ARMY ENGINEER DISTRICT, SEATTLE CORPS OF ENGINEERS SEATTLE, WASHINGTON	Date: 12 NOV 02
	File # 22s/171-90-11
COMBINED ARMS COLLECTIVE TRAINING FACILITY FORT LEWIS WASHINGTON	PROJECT # PN 13643
	Designed by: GOUGH

SKETCH NUMBER: C-12

"F" TYPE
CONNECTOR
(RG-59)

6.3mm (1/4")
PHONE JACK
(2 #18 AWG)

3.2mm (1/8")
PHONE JACK
(2 #18AWG)
(TYP 3 PLACES)



8-PIN MODULAR
TELEPHONE JACK
(CATEGORY 5e)
(T568A)

CAMERA OUTLET

	CAMERA	<p>(4) 2 #18 AWG SHIELDED 6.6 OHM/1000' TYPE CMR NON-PLENUM</p> <p>RG-59U 75 OHM 1 #20 SOLID CU COAX WITH 100% BIFOIL, 95% CU BRAID</p> <p>CATEGORY 5e 4-PAIR UTP #24 SOLID COPPER IN 27mm IMC UON</p>
--	--------	--

PARTIAL CABLE DEFINITIONS

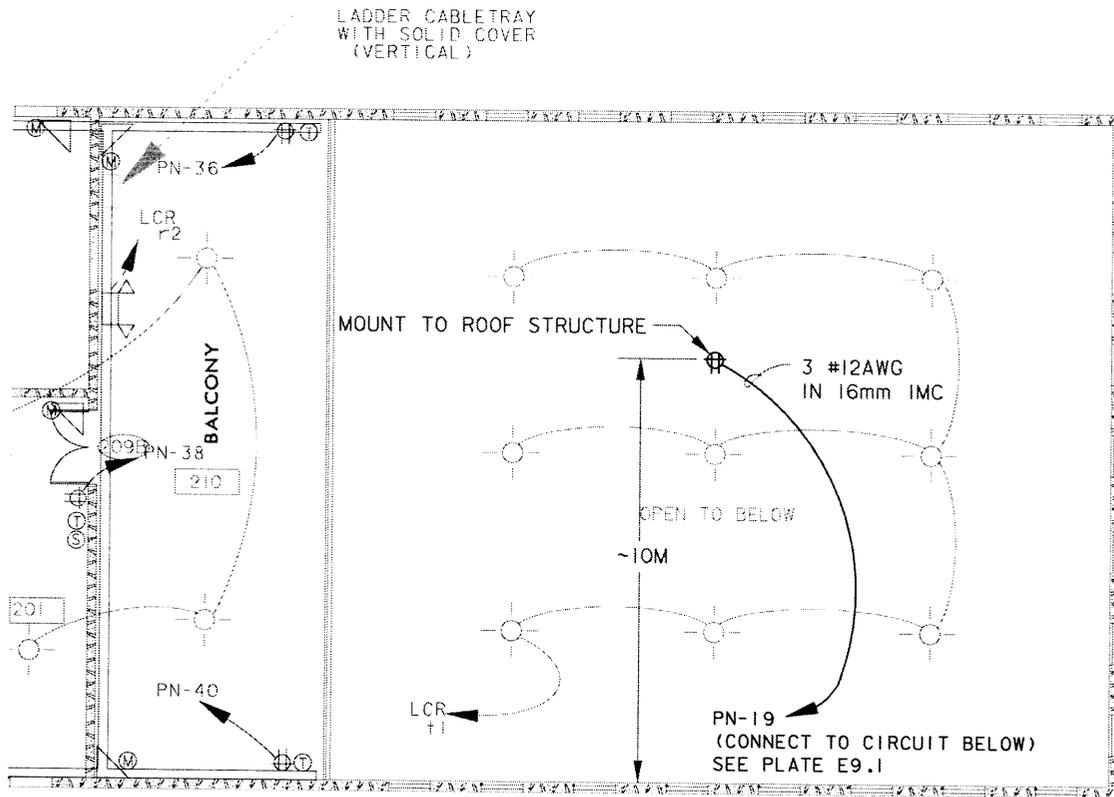
GENERAL NOTE:

INCREASED NUMBER OF #18AWG SHIELDED PAIRS. SUBSTITUTED "F" CONNECTOR FOR 1 OF 2 6.3mm (1/4") PHONE JACKS.

REFERENCE PLATE E35.2

U.S. ARMY ENGINEER DISTRICT, SEATTLE CORPS OF ENGINEERS SEATTLE, WASHINGTON	Date: 28 OCT 02
	File # 22s/171-90-11
COMBINED ARMS COLLECTIVE TRAINING FACILITY FORT LEWIS WASHINGTON	PROJECT # PN 13643
	Designed by: BROWN

SKETCH NUMBER: E-1



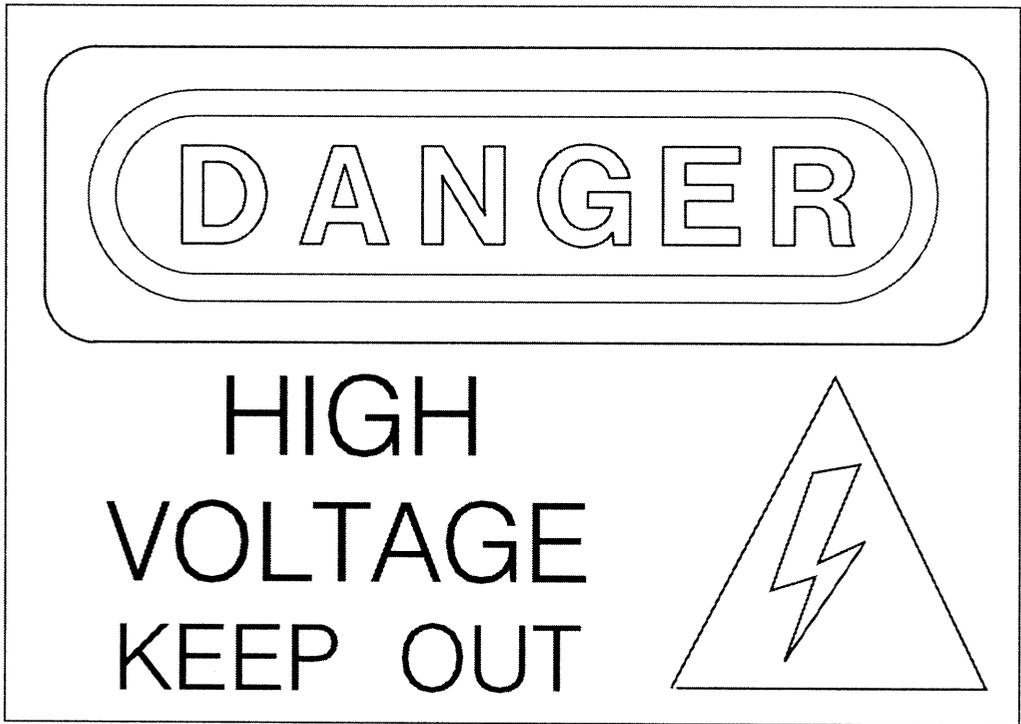
**SCHOOL
PARTIAL SECOND FLOOR PLAN**

REFERENCE PLATE E9.2

U.S. ARMY ENGINEER DISTRICT, SEATTLE CORPS OF ENGINEERS SEATTLE, WASHINGTON	Date: 28 OCT 02
	File # 22s/171-90-11
COMBINED ARMS COLLECTIVE TRAINING FACILITY FORT LEWIS WASHINGTON	PROJECT # PN 13643
	Designed by: BROWN

SKETCH
NUMBER:

E-2



GENERAL NOTE

PROVIDE A HIGH VOLTAGE WARNING SIGN ON THE FENCE ON EACH SIDE OF THE POWER SUBSTATION

REFERENCE PLATE EO.10

U.S. ARMY ENGINEER DISTRICT, SEATTLE CORPS OF ENGINEERS SEATTLE, WASHINGTON	Date: 28 OCT 02	SKETCH NUMBER: E-3
	File # 22s/171-90-11	
COMBINED ARMS COLLECTIVE TRAINING FACILITY FORT LEWIS WASHINGTON	PROJECT # PN 13643 Designed by: BROWN	

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SECTION 04200

MASONRY

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ACI INTERNATIONAL (ACI)

ACI SP-66 (1994) ACI Detailing Manual

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 82 (1997a) Steel Wire, Plain, for Concrete Reinforcement

ASTM A 153/A 153M (1998) Zinc Coating (Hot-Dip) on Iron and Steel Hardware

ASTM A 615/A 615M (1996ael) Deformed and Plain Billet-Steel Bars for Concrete Reinforcement

ASTM C 67 (1999a) Sampling and Testing Brick and Structural Clay Tile

ASTM C 90 (1999a) Loadbearing Concrete Masonry Units

ASTM C 91 (1999) Masonry Cement

ASTM C 270 (1999b) Mortar for Unit Masonry

ASTM C 476 (1999) Grout for Masonry

ASTM C 494/C 494M (1999a) Chemical Admixtures for Concrete

ASTM C 641 (1982; R 1998el) Staining Materials in Lightweight Concrete Aggregates

ASTM C 744 (1999) Prefaced Concrete and Calcium Silicate Masonry Units

ASTM C 780 (1996el) Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry

ASTM C 1019 (1989a; R 1999) Sampling and Testing Grout

ASTM C 1072 (1999) Measurement of Masonry Flexural Bond Strength

ASTM D 2000 (1999) Rubber Products in Automotive Applications

ASTM D 2240	(1997e1) Rubber Property - Durometer Hardness
ASTM D 2287	(1996a) Nonrigid Vinyl Chloride Polymer and Copolymer Molding and Extrusion Compounds
ASTM E 447	(1997) Compressive Strength of Masonry Prisms

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Concrete Masonry Units

Manufacturer's descriptive data.

SD-04 Drawings

Masonry Work; FIO.

Drawings including plans, elevations, and details of wall reinforcement; details of reinforcing bars at corners and wall intersections; offsets; tops, bottoms, and ends of walls; control and expansion joints; and wall openings. Bar splice locations shall be shown. If the Contractor opts to furnish inch-pound CMU products, drawings showing elevation of walls exposed to view and indicating the location of all cut CMU products shall be submitted for approval. Bent bars shall be identified on a bending diagram and shall be referenced and located on the drawings. Wall dimensions, bar clearances, and wall openings greater than one masonry unit in area shall be shown. No approval will be given to the shop drawings until the Contractor certifies that all openings, including those for mechanical and electrical service, are shown. If, during construction, additional masonry openings are required, the approved shop drawings shall be resubmitted with the additional openings shown along with the proposed changes. Location of these additional openings shall be clearly highlighted. The minimum scale for wall elevations shall be 1 to 50. Reinforcement bending details shall conform to the requirements of ACI SP-66.

SD-08 Statements

Cold Weather Installation; FIO.

Cold weather construction procedures.

SD-09 Reports

Efflorescence Test; FIO. Field Testing of Mortar; FIO. Field Testing of Grout; FIO. Prism tests; FIO. Masonry Cement; FIO.

Test reports from an approved independent laboratory. Test reports on a

previously tested material shall be certified as the same as that proposed for use in this project.

Special Inspection; FIO.

Copies of masonry inspector reports.

SD-13 Certificates; FIO

Concrete Masonry Units (CMU) Prefaced Concrete Masonry Units Control Joint Keys Anchors, Ties, and Bar Positioners Expansion-Joint Materials Joint Reinforcement Reinforcing Steel Bars and Rods Masonry Cement Mortar Coloring Insulation Precast Concrete Items Mortar Admixtures Grout Admixtures Glass Block Units and Accessories Ceramic Glazed Structural Clay Facing Units

Certificates of compliance stating that the materials meet the specified requirements.

SD-14 Samples

Concrete Masonry Units (CMU); FIO.

Color samples of three stretcher units and one unit for each type of special shape. Units shall show the full range of color and texture.

Anchors, Ties, and Bar Positioners; FIO.

Two of each type used.

Expansion-Joint Material; FIO.

One piece of each type used.

1.3 SAMPLE MASONRY PANELS

After material samples are approved and prior to starting masonry work, sample masonry panels shall be constructed for each type and color of masonry required. At least 48 hours prior to constructing the sample panel or panels, the Contractor shall submit written notification to the Contracting Officer's Representative. Sample panels shall not be built in, or as part of the structure, but shall be located where directed.

1.3.1 Configuration

Panels shall be L-shaped or otherwise configured to represent all of the wall elements. Panels shall be of the size necessary to demonstrate the acceptable level of workmanship for each type of masonry represented on the project. The minimum size of a straight panel or a leg of an L-shaped panel shall be 2.5 m by 1.2 m.

1.3.2 Composition

Panels shall show full color range, texture, and bond pattern of the masonry work. The Contractor's method for mortar joint tooling; grouting of reinforced vertical cores, collar joints, bond beams, and lintels; positioning, securing, and lapping of reinforcing steel; positioning and lapping of joint reinforcement (including prefabricated corners); and cleaning of masonry work shall be demonstrated during the construction of

the panels. Installation or application procedures for anchors, wall ties, CMU control joints, flashing, and weep holes shall be shown in the sample panels. The panels shall contain a masonry bonded corner that includes a bond beam corner. Panels shall show parging and installation of electrical boxes and conduit. Panels that represent reinforced masonry shall contain a 600 mm by 600 mm opening placed at least 600 mm above the panel base and 600 mm away from all free edges, corners, and control joints. Required reinforcing shall be provided around this opening as well as at wall corners and control joints.

1.3.3 Construction Method

Where anchored veneer walls are required, the Contractor shall demonstrate and receive approval for the method of construction; i.e., either bring up the two wythes together or separately, with the insulation and appropriate ties placed within the specified tolerances across the cavity. Temporary provisions shall be demonstrated to preclude mortar or grout droppings in the cavity and to provide a clear open air space of the dimensions shown on the drawings. Where masonry is to be grouted, the Contractor shall demonstrate and receive approval on the method that will be used to bring up the masonry wythes; support the reinforcing bars; and grout cells, bond beams, lintels, and collar joints using the requirements specified herein. If sealer is specified to be applied to the masonry units, sealer shall be applied to the sample panels. Panels shall be built on a properly designed concrete foundation.

1.3.4 Usage

The completed panels shall be used as the standard of workmanship for the type of masonry represented. Masonry work shall not commence until the sample panel for that type of masonry construction has been completed and approved. Panels shall be protected from the weather and construction operations until the masonry work has been completed and approved. After completion of the work, the sample panels, including all foundation concrete, shall become the property of the Contractor and shall be removed from the construction site.

1.4 DELIVERY, HANDLING, AND STORAGE

Materials shall be delivered, handled, stored, and protected to avoid chipping, breakage, and contact with soil or contaminating material.

1.4.1 Masonry Units

Concrete masonry units shall be covered or protected from inclement weather and shall conform to the moisture content as specified in ASTM C 90 when delivered to the jobsite. In addition, glass block units and prefaced concrete units shall be stored with their finish surfaces covered. Prefabricated lintels shall be marked on top sides to show either the lintel schedule number or the number and size of top and bottom bars.

1.4.2 Reinforcement, Anchors, and Ties

Steel reinforcing bars, coated anchors, ties, and joint reinforcement shall be stored above the ground. Steel reinforcing bars and uncoated ties shall be free of loose mill scale and rust.

1.4.3 Cementitious Materials, Sand and Aggregates

Cementitious and other packaged materials shall be delivered in unopened containers, plainly marked and labeled with manufacturers' names and brands. Cementitious material shall be stored in dry, weathertight enclosures or be completely covered. Cement shall be handled in a manner that will prevent the inclusion of foreign materials and damage by water or dampness. Sand and aggregates shall be stored in a manner to prevent contamination or segregation.

1.5 SPECIAL INSPECTION

A qualified masonry inspector approved by the Contracting Officer shall perform inspection of the masonry work. Minimum qualifications for the masonry inspector shall be 5 years of reinforced masonry inspection experience or acceptance by a State, municipality, or other governmental body having a program of examining and certifying inspectors for reinforced masonry construction. The masonry inspector shall be present during preparation of masonry prisms, sampling and placing of masonry units, placement of reinforcement (including placement of dowels in footings and foundation walls), inspection of grout space, immediately prior to closing of cleanouts, and during grouting operations. The masonry inspector shall assure Contractor compliance with the drawings and specifications. The masonry inspector shall keep a complete record of all inspections and shall submit daily written reports to the Quality Control Supervisory Representative reporting the quality of masonry construction.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

The source of materials which will affect the appearance of the finished work shall not be changed after the work has started except with Contracting Officer's approval. The Contractor has the option to use either hard metric or substitute inch-pound (soft-metric) CMU products. If the Contractor decides to substitute inch-pound CMU products, the following additional requirements shall be met:

- a. Standard units can be special ordered with a height of 190mm (~7 1/2") which will maintain the vertical coursing shown on the drawings and allow for a 10mm (~3/8") bed joint. Units will be cut as required to accommodate the overall horizontal dimensions and openings shown.
- b. Rebars shall not be cut, bent or eliminated to fit into the inch-pound CMU products module.
- c. Cut, exposed brick and CMU products shall be held to a minimum and located where they would have the least impact on the architectural aesthetic goals of the facility.
- d. Other building components, built into the CMU products, such as window frames, door frames, louvers, grilles, fire dampers, etc., that are required to be metric, shall remain metric.
- e. Additional metric guidance shall conform to Section 01415 METRIC MEASUREMENTS.

2.2 CONCRETE MASONRY UNITS (CMU)

Hollow and solid concrete masonry units shall conform to ASTM C 90, Type I.

Cement shall have a low alkali content and be of one brand.

2.2.1 Aggregates

Lightweight aggregates and blends of lightweight and heavier aggregates in proportions used in producing the units, shall comply with the following requirements when tested for stain-producing iron compounds in accordance with ASTM C 641: by visual classification method, the iron stain deposited on the filter paper shall not exceed the "light stain" classification.

2.2.2 Kinds and Shapes

Units shall be modular in size and shall include closer, jamb, header, lintel, and bond beam units and special shapes and sizes to complete the work as indicated. In exposed interior masonry surfaces, units having a bullnose shall be used for vertical external corners except at door, window, and louver jambs. Radius of the bullnose shall be 25 mm (1 inch). Units used in exposed masonry surfaces in any one building shall have a uniform fine to medium texture and a uniform color.

2.3 PREFACED CONCRETE MASONRY UNITS

Prefaced concrete masonry units shall conform to ASTM C 744 using masonry units conforming to ASTM C 90, Type 1. The facing shall turn over the edges and ends of the unit at least 10 mm (3/8 inch) in the direction of the thickness of the unit to form a lip at least 2 mm (1/16 inch) thick. Variation in color and texture shall not exceed that of the approved samples. All shapes and sizes shall be provided for a complete installation. Bullnose units shall be used along sills and caps and at vertical external corners including door jambs, window jambs, and other such openings. Radius of the bullnose shall be 25 mm (1 inch). Base units shall be coved to meet finished floor surfaces where ceramic tile floor occurs.

~~2.8 PRECAST CONCRETE ITEMS~~

~~Trim, lintels, copings, splashblocks and door sills shall be factory made units from a plant regularly engaged in producing precast concrete units. Unless otherwise indicated, concrete shall be 28 MPa (4000 psi) minimum conforming to Section 03300 CAST IN PLACE STRUCTURAL CONCRETE using 13 mm (1/2 inch) to No. 4 nominal size coarse aggregate, and minimum reinforcement shall be the reinforcement required for handling of the units. Clearance of 20 mm shall be maintained between reinforcement and faces of units. Unless precast concrete items have been subjected during manufacture to saturated steam pressure of at least 827 kPa (120 psi) for at least 5 hours, the items, after casting, shall be either damp cured for 24 hours or steam cured and shall then be aged under cover for 28 days or longer. Cast concrete members weighing over 35 kg shall have built in loops of galvanized wire or other approved provisions for lifting and anchoring. Units shall have beds and joints at right angles to the face, with sharp true arises and shall be cast with drip grooves on the underside where units overhang walls. Exposed to view surfaces shall be free of surface voids, spalls, cracks, and chipped or broken edges. Precast units exposed to view shall be of uniform appearance and color. Unless otherwise specified, units shall have a smooth dense finish. Prior to use, each item shall be wetted and inspected for crazing. Items showing evidence of dusting, spalling, crazing, or having surfaces treated with a protective coating will be rejected.~~

~~2.8.2 Sills and Copings~~

~~Sills and copings shall be cast with washes. Sills for windows having mullions shall be cast in sections with head joints at mullions and a 6 mm (1/4 inch) allowance for mortar joints. The ends of sills, except a 20 mm (3/4 inch) wide margin at exposed surfaces, shall be roughened for bond. Treads of door sills shall have rounded nosings.~~

~~2.8.3 Splash Blocks~~

~~Splash blocks shall be as detailed. Reinforcement shall be the manufacturer's standard.~~

2.4 MORTAR

Mortar shall be Type S in accordance with the proportion specification of ASTM C 270 except Type S cement-lime mortar proportions shall be 1 part cement, 1/2 part lime and 4-1/2 parts aggregate; Type N cement-lime mortar proportions shall be 1 part cement, 1 part lime and 6 parts aggregate; when masonry cement ASTM C 91 is used the maximum air content shall be limited to 12 percent and performance equal to cement-lime mortar shall be verified. Verification of masonry cement performance shall be based on ASTM C 780 and ASTM C 1072. Mortar for prefaced concrete masonry unit wainscots shall contain aggregates with 100 percent passing the 2.36 mm sieve and 95 percent passing the 1.18 mm . Pointing mortar in showers and kitchens shall contain ammonium stearate, or aluminum tri-stearate, or calcium stearate in an amount equal to 3 percent by weight of cement used. Cement shall have a low alkali content and be of one brand. Aggregates shall be from one source.

2.4.1 Admixtures

In cold weather, a non-chloride based accelerating admixture may be used subject to approval. Accelerating admixture shall be non-corrosive, shall contain less than 0.2 percent chlorides, and shall conform to ASTM C 494/C 494M, Type C.

2.4.2 Coloring

Mortar coloring shall be added to the mortar used for exposed masonry surfaces to produce a uniform color matching the CMU block. Mortar coloring shall not exceed 3 percent of the weight of cement for carbon black and ten percent of the weight of cement for all other pigments. Mortar coloring shall be chemically inert, of finely ground limeproof pigment, and furnished in accurately pre-measured and packaged units that can be added to a measured amount of cement.

2.5 GROUT

Grout shall conform to ASTM C 476. Cement used in grout shall have a low alkali content. Grout slump shall be between 200 and 250 mm. Grout shall be used subject to the limitations of Table III. Proportions shall not be changed and materials with different physical or chemical characteristics shall not be used in grout for the work unless additional evidence is furnished that the grout meets the specified requirements.

2.5.1 Admixtures

In cold weather, a non-chloride based accelerating admixture may be used

subject to approval. Accelerating admixture shall be non-corrosive, shall contain less than 0.2 percent chlorides, and shall conform to ASTM C 494/C 494M, Type C.

2.5.2 Grout Barriers

Grout barriers for vertical cores shall consist of fine mesh wire, fiberglass, or expanded metal.

2.6 ANCHORS, TIES, AND BAR POSITIONERS

Anchors and ties shall be fabricated without drips or crimps and shall be zinc-coated in accordance with ASTM A 153/A 153M, Class B-2. Steel wire used for anchors and ties shall be fabricated from steel wire conforming to ASTM A 82. Anchors and ties shall be sized to provide a minimum of 16 mm mortar cover from either face.

2.6.1 Bar Positioners

Bar positioners, used to prevent displacement of reinforcing bars during the course of construction, shall be factory fabricated from 9 gauge steel wire or equivalent, and coated with a hot-dip galvanized finish. Not more than one wire shall cross the cell.

2.7 REINFORCING STEEL BARS AND RODS

Reinforcing steel bars and rods shall conform to ASTM A 615/A 615M, Grade 60.

2.8 CONTROL JOINT KEYS

Control joint keys shall be a factory fabricated solid section of natural or synthetic rubber (or combination thereof) conforming to ASTM D 2000 or polyvinyl chloride conforming to ASTM D 2287. The material shall be resistant to oils and solvents. The control joint key shall be provided with a solid shear section not less than 16 mm (5/8 inch) thick and 10 mm (3/8 inch) thick flanges, with a tolerance of plus or minus 2 mm (1/16 inch). The control joint key shall fit neatly, but without forcing, in masonry unit jamb sash grooves. The control joint key shall be flexible at a temperature of minus 34 degrees C (minus 30 degrees F) after five hours exposure, and shall have a durometer hardness of not less than 70 when tested in accordance with ASTM D 2240.

2.9 EXPANSION-JOINT MATERIALS

Backer rod and sealant shall be adequate to accommodate joint compression equal to 50 percent of the width of the joint. The backer rod shall be compressible rod stock of polyethylene foam, polyurethane foam, butyl rubber foam, or other flexible, nonabsorptive material as recommended by the sealant manufacturer. Sealant shall conform to Section 07900 JOINT SEALING.

2.10 FLASHING

Flashing shall be as specified in Section 07600 SHEET METALWORK, GENERAL.

PART 3 EXECUTION

3.1 ENVIRONMENTAL REQUIREMENTS

3.1.1 Hot Weather Installation

The following precautions shall be taken if masonry is erected when the ambient air temperature is more than 37 degrees C in the shade and the relative humidity is less than 50 percent. All masonry materials shall be shaded from direct sunlight; mortar beds shall be spread no more than 1.2 m ahead of masonry; masonry units shall be set within one minute of spreading mortar; and after erection, masonry shall be protected from direct exposure to wind and sun for 48 hours.

3.1.2 Cold Weather Installation

Before erecting masonry when ambient temperature or mean daily air temperature falls below 4 degrees C, a written statement of proposed cold weather construction procedures shall be submitted for approval. The following precautions shall be taken during all cold weather erection.

3.1.2.1 Preparation

Ice or snow formed on the masonry bed shall be thawed by the application of heat. Heat shall be applied carefully until the top surface of the masonry is dry to the touch. Sections of masonry deemed frozen and damaged shall be removed before continuing construction of those sections.

- a. Air Temperature 4 to 0 degrees C. Sand or mixing water shall be heated to produce mortar temperatures between 4 degrees C and 49 degrees C.
- b. Air Temperature 0 to minus 4 degrees C. Sand and mixing water shall be heated to produce mortar temperatures between 4 degrees C and 49 degrees C. Temperature of mortar on boards shall be maintained above freezing.
- c. Air Temperature minus 4 to minus 7 degrees C. Sand and mixing water shall be heated to provide mortar temperatures between 4 degrees C and 49 degrees C. Temperature of mortar on boards shall be maintained above freezing. Sources of heat shall be used on both sides of walls under construction. Windbreaks shall be employed when wind is in excess of 24 km/hour.
- d. Air Temperature minus 7 degrees C and below. Sand and mixing water shall be heated to provide mortar temperatures between 4 degrees C and 49 degrees C. Enclosure and auxiliary heat shall be provided to maintain air temperature above 0 degrees C. Temperature of units when laid shall not be less than minus 7 degrees C.

3.1.2.2 Completed Masonry and Masonry Not Being Worked On

- a. Mean daily air temperature 4 degrees C to 0 degrees C. Masonry shall be protected from rain or snow for 24 hours by covering with weather-resistive membrane.
- b. Mean daily air temperature 0 degrees C to minus 4 degrees C. Masonry shall be completely covered with weather-resistant membrane for 24 hours.
- c. Mean Daily Air Temperature minus 4 degrees C to minus 7 degrees C.

Masonry shall be completely covered with insulating blankets or equally protected for 24 hours.

- d. Mean Daily Temperature minus 7 degrees C and Below. Masonry temperature shall be maintained above 0 degrees C for 24 hours by enclosure and supplementary heat, by electric heating blankets, infrared heat lamps, or other approved methods.

3.2 LAYING MASONRY UNITS

Masonry units shall be laid in running bond pattern. Facing courses shall be level with back-up courses, unless the use of adjustable ties has been approved in which case the tolerances shall be plus or minus 13 mm. Each unit shall be adjusted to its final position while mortar is still soft and plastic. Units that have been disturbed after the mortar has stiffened shall be removed, cleaned, and relaid with fresh mortar. Air spaces, cavities, chases, expansion joints, and spaces to be grouted shall be kept free from mortar and other debris. Units used in exposed masonry surfaces shall be selected from those having the least amount of chipped edges or other imperfections detracting from the appearance of the finished work. Vertical joints shall be kept plumb. Units being laid and surfaces to receive units shall be free of water film and frost. Solid units shall be laid in a nonfurrowed full bed of mortar. Mortar for veneer wythes shall be beveled and sloped toward the center of the wythe from the cavity side. Units shall be shoved into place so that the vertical joints are tight. Vertical joints of brick and the vertical face shells of concrete masonry units, except where indicated at control, expansion, and isolation joints, shall be completely filled with mortar. Mortar will be permitted to protrude up to 13 mm into the space or cells to be grouted. Means shall be provided to prevent mortar from dropping into the space below. In double wythe construction, the inner wythe may be brought up not more than 400 mm ahead of the outer wythe. Collar joints shall be filled with mortar or grout during the laying of the facing wythe, and filling shall not lag the laying of the facing wythe by more than 200 mm.

3.2.1 Surface Preparation

Surfaces upon which masonry is placed shall be cleaned of laitance, dust, dirt, oil, organic matter, or other foreign materials and shall be slightly roughened to provide a surface texture with a depth of at least 3 mm. Sandblasting shall be used, if necessary, to remove laitance from pores and to expose the aggregate.

3.2.2 Forms and Shores

Forms and shores shall be sufficiently rigid to prevent deflections which may result in cracking or other damage to supported masonry and sufficiently tight to prevent leakage of mortar and grout. Supporting forms and shores shall not be removed in less than 10 days.

3.2.3 Concrete Masonry Units

Units in piers, pilasters, columns, starting courses on footings, solid foundation walls, lintels, and beams, and where cells are to be filled with grout shall be full bedded in mortar under both face shells and webs. Other units shall be full bedded under both face shells. Head joints shall be filled solidly with mortar for a distance in from the face of the unit not less than the thickness of the face shell. Foundation walls below grade shall be grouted solid. Jamb units shall be of the shapes and sizes

to conform with wall units. Solid units may be incorporated in the masonry work where necessary to fill out at corners, gable slopes, and elsewhere as approved. Double walls shall be stiffened at wall-mounted plumbing fixtures by use of strap anchors, two above each fixture and two below each fixture, located to avoid pipe runs, and extending from center to center of the double wall. Walls and partitions shall be adequately reinforced for support of wall-hung plumbing fixtures when chair carriers are not specified.

3.2.4 Wetting of Units

Wetting of clay, shale brick, or hollow brick units having an initial rate of absorption of more than 0.155 gm per minute per square cm (1 gm per minute per square inch) of bed surface shall be in conformance with ASTM C 67. The method of wetting shall ensure that each unit is nearly saturated but surface dry when laid.

3.2.4.1 Solid Units

Bed, head, and collar joints shall be completely filled with mortar.

3.2.4.2 Hollow Units

Hollow units shall be laid as specified for concrete masonry units.

3.2.5 Tolerances

Masonry shall be laid plumb, true to line, with courses level. Bond pattern shall be kept plumb throughout. Corners shall be square unless noted otherwise. Except for walls constructed of prefaced concrete masonry units, masonry shall be laid within the following tolerances (plus or minus unless otherwise noted):

TABLE II

TOLERANCES

Variation from the plumb in the lines
and surfaces of columns, walls and arises

In adjacent masonry units	3 mm
In 3 m	6 mm
In 6 m	10 mm
In 12 m or more	13 mm

Variations from the plumb for external corners,
expansion joints, and other conspicuous lines

In 6 m	6 mm
In 12 m or more	13 mm

Variations from the level for exposed lintels,
sills, parapets, horizontal grooves, and other
conspicuous lines

In 6 m	6 mm
In 12 m or more	13 mm

Variation from level for bed joints and top
surfaces of bearing walls

In 3 m	6 mm
In 12 m or more	13 mm

Variations from horizontal lines

In 3 m	6 mm
In 6 m	10 mm
In 12 m or more	13 mm

Variations in cross sectional dimensions of
columns and in thickness of walls

Minus	6 mm
Plus	13 mm

3.2.6 Cutting and Fitting

Full units of the proper size shall be used wherever possible, in lieu of cut units. Cutting and fitting, including that required to accommodate the work of others, shall be done by masonry mechanics using power masonry saws. Concrete masonry units may be wet or dry cut. Wet cut units, before being placed in the work, shall be dried to the same surface-dry appearance as uncut units being laid in the wall. Cut edges shall be clean, true and sharp. Openings in the masonry shall be made carefully so that wall plates, cover plates or escutcheons required by the installation will completely conceal the openings and will have bottoms parallel with the masonry bed joints. Reinforced masonry lintels shall be provided above openings over 300 mm wide for pipes, ducts, cable trays, and other wall penetrations, unless steel sleeves are used.

3.2.7 Jointing

Joints shall be tooled when the mortar is thumbprint hard. Horizontal joints shall be tooled last. Joints shall be brushed to remove all loose and excess mortar. Mortar joints shall be finished as follows:

3.2.7.1 Flush Joints

Joints in concealed masonry surfaces and joints at electrical outlet boxes in wet areas shall be flush cut. Flush cut joints shall be made by cutting off the mortar flush with the face of the wall. Joints in unparted masonry walls below grade shall be pointed tight. Flush joints for architectural units, such as fluted units, shall completely fill both the head and bed joints.

3.2.7.2 Tooled Joints

Joints in exposed exterior and interior masonry surfaces shall be tooled slightly concave. Joints shall be tooled with a jointer slightly larger than the joint width so that complete contact is made along the edges of the unit. Tooling shall be performed so that the mortar is compressed and the joint surface is sealed. Jointer of sufficient length shall be used to obtain a straight and true mortar joint.

3.2.7.3 Door and Window Frame Joints

On the exposed interior side of exterior frames, joints between frames and abutting masonry walls shall be raked to a depth of 10 mm. On the exterior side of exterior frames, joints between frames and abutting masonry walls shall be raked to a depth of 10 mm.

3.2.8 Joint Widths

Joint widths shall be as follows:

3.2.8.1 Concrete Masonry Units

Concrete masonry units shall have 10 mm (3/8 inch) joints, except for prefaced concrete masonry units.

3.2.8.2 Prefaced Concrete Masonry Units

Prefaced concrete masonry units shall have a joint width of 10 mm (3/8 inch) wide on unfaced side and not less than 5 mm nor more than 6 mm wide on

prefaced side.

3.2.8.3 Brick

Brick joint widths shall be the difference between the actual and nominal dimensions of the brick in either height or length. Brick expansion joint widths shall be as shown.

3.2.9 Embedded Items

Spaces around built-in items shall be filled with mortar. Openings around flush-mount electrical outlet boxes in wet locations shall be pointed with mortar. Anchors, ties, wall plugs, accessories, flashing, pipe sleeves and other items required to be built-in shall be embedded as the masonry work progresses. Anchors, ties and joint reinforcement shall be fully embedded in the mortar. Cells receiving anchor bolts and cells of the first course below bearing plates shall be filled with grout.

3.2.10 Unfinished Work

Unfinished work shall be stepped back for joining with new work. Tothing may be resorted to only when specifically approved. Loose mortar shall be removed and the exposed joints shall be thoroughly cleaned before laying new work.

3.2.11 Masonry Wall Intersections

Each course shall be masonry bonded at corners and elsewhere as shown. Masonry walls shall be anchored or tied together at corners and intersections with bond beam reinforcement and prefabricated corner or tee pieces of joint reinforcement as shown.

3.2.12 Partitions

Partitions shall be continuous from floor to underside of floor or roof deck where shown. Openings in firewalls around joists or other structural members shall be filled as indicated or approved. Where suspended ceilings on both sides of partitions are indicated, the partitions other than those shown to be continuous may be stopped approximately 100 mm (4 inches) above the ceiling level. An isolation joint shall be placed in the intersection between partitions and structural or exterior walls as shown. Interior partitions having 100 mm (4 inch) nominal thick units shall be tied to intersecting partitions of 100 mm (4 inch) units, 125 mm into partitions of 150 mm (6 inch) units, and 175 into partitions of 200 mm (8 inch) or thicker units. Cells within vertical plane of ties shall be filled solid with grout for full height of partition or solid masonry units may be used. Interior partitions having masonry walls over 100 mm (4 inches) thick shall be tied together with joint reinforcement. Partitions containing joint reinforcement shall be provided with prefabricated pieces at corners and intersections or partitions.

3.3 PREFACED CONCRETE MASONRY UNITS

Prefaced concrete masonry units shall be installed as specified for concrete masonry units and as required herein. Single-faced units may be installed through the wall where walls or partitions are indicated to have structural clay facing unit finish on one side only. The facing shall be used for dimensional and plane reference in the installation. Two-faced walls or partitions shall consist of two units bonded and tied together as

specified for composite walls. Wainscots shall be of full courses to approximate as nearly as possible the height indicated, except that in no case shall the wainscots be lower than 50 mm below the specified height. Units shall be set level and true so that bases and walls will present true planes and surfaces free of waviness, offset, or other distortion. Joint reinforcing shall be placed not over 400 mm (16 inches) on center vertically.

3.4 MORTAR

Mortar shall be mixed in a mechanically operated mortar mixer for at least 3 minutes, but not more than 5 minutes. Measurement of ingredients for mortar shall be by volume. Ingredients not in containers, such as sand, shall be accurately measured by the use of measuring boxes. Water shall be mixed with the dry ingredients in sufficient amount to provide a workable mixture which will adhere to the vertical surfaces of masonry units. Mortar that has stiffened because of loss of water through evaporation shall be retempered by adding water to restore the proper consistency and workability. Mortar that has reached its initial set or that has not been used within 2-1/2 hours after mixing shall be discarded.

3.5 REINFORCING STEEL

Reinforcement shall be cleaned of loose, flaky rust, scale, grease, mortar, grout, or other coating which might destroy or reduce its bond prior to placing grout. Bars with kinks or bends not shown on the drawings shall not be used. Reinforcement shall be placed prior to grouting. Unless otherwise indicated, vertical wall reinforcement shall extend to within 50 mm of tops of walls.

3.5.1 Positioning Bars

Vertical bars shall be accurately placed within the cells at the positions indicated on the drawings. A minimum clearance of 13 mm shall be maintained between the bars and masonry units. Minimum clearance between parallel bars shall be one diameter of the reinforcement. Vertical reinforcing may be held in place using bar positioners located near the ends of each bar and at intermediate intervals of not more than 192 diameters of the reinforcement. Column and pilaster ties shall be wired in position around the vertical steel. Ties shall be in contact with the vertical reinforcement and shall not be placed in horizontal bed joints.

3.5.2 Splices

Bars shall be lapped a minimum of 48 diameters of the reinforcement. Welded or mechanical connections shall develop at least 125 percent of the specified yield strength of the reinforcement.

3.6 PLACING GROUT

Cells containing reinforcing bars shall be filled with grout. Hollow masonry units in walls or partitions supporting plumbing, heating, or other mechanical fixtures, voids at door and window jambs, and other indicated spaces shall be filled solid with grout. Cells under lintel bearings on each side of openings shall be filled solid with grout for full height of openings. Walls below grade, lintels, and bond beams shall be filled solid with grout. Units other than open end units may require grouting each course to preclude voids in the units. Grout not in place within 1-1/2 hours after water is first added to the batch shall be discarded.

Sufficient time shall be allowed between grout lifts to preclude displacement or cracking of face shells of masonry units. If blowouts, flowouts, misalignment, or cracking of face shells should occur during construction, the wall shall be torn down and rebuilt.

3.6.1 Vertical Grout Barriers for Fully Grouted Walls

Grout barriers shall be provided not more than 10 m apart, or as required, to limit the horizontal flow of grout for each pour.

3.6.2 Horizontal Grout Barriers

Grout barriers shall be embedded in mortar below cells of hollow units receiving grout.

3.6.3 Grout Holes and Cleanouts

3.6.3.1 Grout Holes

Grouting holes shall be provided in slabs, spandrel beams, and other in-place overhead construction. Holes shall be located over vertical reinforcing bars or as required to facilitate grout fill in bond beams. Additional openings spaced not more than 400 mm (16 inches) on centers shall be provided where grouting of all hollow unit masonry is indicated. Openings shall not be less than 100 mm in diameter or 75 by 100 mm in horizontal dimensions. Upon completion of grouting operations, grouting holes shall be plugged and finished to match surrounding surfaces.

3.6.3.2 Cleanouts for Hollow Unit Masonry Construction

Cleanout holes shall be provided at the bottom of every pour in cores containing vertical reinforcement when the height of the grout pour exceeds 1.5 m. Where all cells are to be grouted, cleanout courses shall be constructed using bond beam units in an inverted position to permit cleaning of all cells. Cleanout holes shall be provided at a maximum spacing of 800 mm (32 inches) where all cells are to be filled with grout.

A new series of cleanouts shall be established if grouting operations are stopped for more than 4 hours. Cleanouts shall not be less than 75 by 100 mm openings cut from one face shell. Manufacturer's standard cutout units may be used at the Contractor's option. Cleanout holes shall not be closed until masonry work, reinforcement, and final cleaning of the grout spaces have been completed and inspected. For walls which will be exposed to view, cleanout holes shall be closed in an approved manner to match surrounding masonry.

3.6.3.3 Cleanouts for Solid Unit Masonry Construction

Cleanouts for construction of walls consisting of a grout filled cavity between solid masonry wythes shall be provided at the bottom of every pour by omitting every other masonry unit from one wythe. A new series of cleanouts shall be established if grouting operations are stopped for more than 4 hours. Cleanout holes shall not be plugged until masonry work, reinforcement, and final cleaning of the grout spaces have been completed and inspected. For walls which will be exposed to view, cleanout holes shall be closed in an approved manner to match surrounding masonry.

3.6.4 Grouting Equipment

3.6.4.1 Grout Pumps

Pumping through aluminum tubes will not be permitted. Pumps shall be operated to produce a continuous stream of grout without air pockets, segregation, or contamination. Upon completion of each day's pumping, waste materials and debris shall be removed from the equipment, and disposed of outside the masonry.

3.6.4.2 Vibrators

Internal vibrators shall maintain a speed of not less than 5,000 impulses per minute when submerged in the grout. At least one spare vibrator shall be maintained at the site at all times. Vibrators shall be applied at uniformly spaced points not further apart than the visible effectiveness of the machine. Duration of vibration shall be limited to time necessary to produce satisfactory consolidation without causing segregation.

3.6.5 Grout Placement

Masonry shall be laid to the top of a pour before placing grout. Grout shall not be placed in two-wythe solid unit masonry cavity until mortar joints have set for at least 3 days during hot weather and 5 days during cold damp weather. Grout shall not be placed in hollow unit masonry until mortar joints have set for at least 24 hours. Grout shall be placed using a hand bucket, concrete hopper, or grout pump to completely fill the grout spaces without segregation of the aggregates. Vibrators shall not be inserted into lower pours that are in a semi-solidified state. The height of grout pours and type of grout used shall be limited by the dimensions of grout spaces as indicated in Table III. Low-lift grout methods may be used on pours up to and including 1.5 m in height. High-lift grout methods shall be used on pours exceeding 1.5 m in height.

3.6.5.1 Low-Lift Method

Grout shall be placed at a rate that will not cause displacement of the masonry due to hydrostatic pressure of the grout. Mortar protruding more than 13 mm into the grout space shall be removed before beginning the grouting operation. Grout pours 300 mm or less in height shall be consolidated by mechanical vibration or by puddling. Grout pours over 300 mm in height shall be consolidated by mechanical vibration and reconsolidated by mechanical vibration after initial water loss and settlement has occurred. Vibrators shall not be inserted into lower pours that are in a semi-solidified state. Low-lift grout shall be used subject to the limitations of Table III.

3.6.5.2 High-Lift Method

Mortar droppings shall be cleaned from the bottom of the grout space and from reinforcing steel. Mortar protruding more than 6 mm into the grout space shall be removed by dislodging the projections with a rod or stick as the work progresses. Reinforcing, bolts, and embedded connections shall be rigidly held in position before grouting is started. CMU units shall not be pre-wetted. Grout, from the mixer to the point of deposit in the grout space shall be placed as rapidly as practical by pumping and placing methods which will prevent segregation of the mix and cause a minimum of grout splatter on reinforcing and masonry surfaces not being immediately encased in the grout lift. The individual lifts of grout shall be limited to 1.2 m in height. The first lift of grout shall be placed to a uniform height within the pour section and vibrated thoroughly to fill all voids. This first vibration shall follow immediately behind the pouring of the

grout using an approved mechanical vibrator. After a waiting period sufficient to permit the grout to become plastic, but before it has taken any set, the succeeding lift shall be poured and vibrated 300 to 450 mm into the preceding lift. If the placing of the succeeding lift is going to be delayed beyond the period of workability of the preceding, each lift shall be reconsolidated by reworking with a second vibrator as soon as the grout has taken its settlement shrinkage. The waiting, pouring, and reconsolidation steps shall be repeated until the top of the pour is reached. The top lift shall be reconsolidated after the required waiting period. The high-lift grouting of any section of wall between vertical grout barriers shall be completed to the top of a pour in one working day unless a new series of cleanout holes is established and the resulting horizontal construction joint cleaned. High-lift grout shall be used subject to the limitations in Table III.

TABLE III

POUR HEIGHT AND TYPE OF GROUT FOR VARIOUS GROUT SPACE DIMENSIONS

Maximum Grout Pour Height (m) (4)	Grout Type	Grouting Procedure	Minimum Dimensions of the Total Clear Areas Within Grout Spaces and Cells (mm) (1,2)	
			Multiwythe Masonry (3)	Hollow-unit Masonry
0.3	Fine	Low Lift	20	40 x 50
1.5	Fine	Low Lift	50	50 x 75
2.4	Fine	High Lift	50	50 x 75
3.6	Fine	High Lift	65	65 x 75
7.3	Fine	High Lift	75	75 x 75
0.3	Coarse	Low Lift	40	40 x 75
1.5	Coarse	Low Lift	50	65 x 75
2.4	Coarse	High Lift	50	75 x 75
3.6	Coarse	High Lift	65	75 x 75
7.3	Coarse	High Lift	75	75 x 100

Notes:

- (1) The actual grout space or cell dimension must be larger than the sum of the following items:
 - a) The required minimum dimensions of total clear areas given in the table above;
 - b) The width of any mortar projections within the space;
 - c) The horizontal projections of the diameters of the horizontal reinforcing bars within a cross section of the grout space or cell.
- (2) The minimum dimensions of the total clear areas shall be made up of one or more open areas, with at least one area being 20 mm or greater in width.
- (3) For grouting spaces between masonry wythes.
- (4) Where only cells of hollow masonry units containing reinforcement are grouted, the maximum height of the pour shall not exceed the distance between horizontal bond beams.

3.7 BOND BEAMS

Bond beams shall be filled with grout and reinforced as indicated on the drawings. Grout barriers shall be installed under bond beam units to retain the grout as required. Reinforcement shall be continuous, including around corners, except through control joints or expansion joints, unless otherwise indicated on the drawings. Where splices are required for continuity, reinforcement shall be lapped 48 bar diameters. A minimum clearance of 13 mm shall be maintained between reinforcement and interior faces of units.

3.8 CONTROL JOINTS

Control joints shall be provided as indicated and shall be constructed by using sash jamb units with control joint key in accordance with the details shown on the drawings. Sash jamb units shall have a 19 by 19 mm (3/4 by 3/4 inch) groove near the center at end of each unit. The vertical mortar joint at control joint locations shall be continuous, including through all bond beams. This shall be accomplished by utilizing half blocks in alternating courses on each side of the joint. The control joint key shall be interrupted in courses containing continuous bond beam steel. In single wythe exterior masonry walls, the exterior control joints shall be raked to a depth of 20 mm; backer rod and sealant shall be installed in accordance with Section 07900 JOINT SEALING. Exposed interior control joints shall be raked to a depth of 6 mm. Concealed control joints shall be flush cut.

3.9 BRICK EXPANSION JOINTS AND CONCRETE MASONRY VENEER JOINTS

Brick expansion joints and concrete masonry veneer joints shall be provided and constructed as shown on the drawings. Joints shall be kept free of mortar and other debris.

3.10 LINTELS

3.10.1 Masonry Lintels

Masonry lintels shall be constructed with lintel units filled solid with grout in all courses and reinforced with a minimum of two No. 4 bars in the bottom course unless otherwise indicated on the drawings. Lintel reinforcement shall extend beyond each side of masonry opening 40 bar diameters or 600 mm, whichever is greater. Reinforcing bars shall be supported in place prior to grouting and shall be located 15 mm above the bottom inside surface of the lintel unit.

3.11 SILLS AND COPINGS

Sills and copings shall be set in a full bed of mortar with faces plumb and true.

3.12 ANCHORAGE TO CONCRETE AND STRUCTURAL STEEL

3.12.1 Anchorage to Concrete

Anchorage of masonry to the face of concrete columns, beams, or walls shall be with dovetail anchors spaced not over 400 mm (16 inches) on centers vertically and 600 mm (24 inches) on center horizontally.

3.12.2 Anchorage to Structural Steel

Masonry shall be anchored to vertical structural steel framing with

adjustable steel wire anchors spaced not over 400 mm (16 inches) on centers vertically, and if applicable, not over 600 mm (24 inches) on centers horizontally.

3.13 PARGING

The outside face of below-grade exterior concrete-masonry unit walls enclosing usable rooms and spaces, except crawl spaces, shall be parged with type S mortar. Parging shall not be less than 13 mm thick troweled to a smooth dense surface so as to provide a continuous unbroken shield from top of footings to a line 150 mm below adjacent finish grade, unless otherwise indicated. Parging shall be coved at junction of wall and footing. Parging shall be damp-cured for 48 hours or more before backfilling. Parging shall be protected from freezing temperatures until hardened.

3.14 SPLASH BLOCKS

Splash blocks shall be located as shown.

3.15 POINTING AND CLEANING

After mortar joints have attained their initial set, but prior to hardening, mortar and grout daubs or splashings shall be completely removed from masonry-unit surfaces that will be exposed or painted. Before completion of the work, defects in joints of masonry to be exposed or painted shall be raked out as necessary, filled with mortar, and tooled to match existing joints. Immediately after grout work is completed, scum and stains which have percolated through the masonry work shall be removed using a high pressure stream of water and a stiff bristled brush. Masonry surfaces shall not be cleaned, other than removing excess surface mortar, until mortar in joints has hardened. Masonry surfaces shall be left clean, free of mortar daubs, dirt, stain, and discoloration, including scum from cleaning operations, and with tight mortar joints throughout. Metal tools and metal brushes shall not be used for cleaning.

3.15.1 Concrete Masonry Unit and Concrete Brick Surfaces

Exposed concrete masonry unit and concrete brick surfaces shall be dry-brushed at the end of each day's work and after any required pointing, using stiff-fiber bristled brushes.

3.15.2 Prefaced Concrete Masonry Unit Surfaces

Prefaced concrete masonry unit surfaces shall be cleaned with soap powder and clean water applied with stiff fiber brushes. Excess mortar shall be removed with wood paddles. Metal cleaning tools, metal brushes, abrasive powders, and acid solutions shall not be used. At the completion of cleaning operations, the surfaces shall be rinsed with clean water. In areas of traffic within the building, a barricade of wood supported by framing lumber shall be erected to protect the units. In other areas, a heavy kraft-type building paper shall be taped over the units until final acceptance.

3.16 BEARING PLATES

Bearing plates for beams, joists, joist girders and similar structural members shall be set to the proper line and elevation with damp-pack bedding mortar, except where non-shrink grout is indicated. Bedding mortar

and non-shrink grout shall be as specified in Section 03300CAST-IN-PLACE STRUCTURAL CONCRETE.

3.17 PROTECTION

Facing materials shall be protected against staining. Top of walls shall be covered with nonstaining waterproof covering or membrane when work is not in progress. Covering of the top of the unfinished walls shall continue until the wall is waterproofed with a complete roof or parapet system. Covering shall extend a minimum of 600 mm down on each side of the wall and shall be held securely in place. Before starting or resuming, top surface of masonry in place shall be cleaned of loose mortar and foreign material.

3.18 TEST REPORTS

3.18.1 Field Testing of Mortar

At least three specimens of mortar shall be taken each day. A layer of mortar 13 to 16 mm thick shall be spread on the masonry units and allowed to stand for one minute. The specimens shall then be prepared and tested for compressive strength in accordance with ASTM C 780.

3.18.2 Field Testing of Grout

Field sampling and testing of grout shall be in accordance with the applicable provisions of ASTM C 1019. A minimum of three specimens of grout per day shall be sampled and tested. Each specimen shall have a minimum ultimate compressive strength of 13.8 MPa at 28 days.

3.18.3 Efflorescence Test

Brick which will be exposed to weathering shall be tested for efflorescence. Tests shall be scheduled far enough in advance of starting masonry work to permit retesting if necessary. Sampling and testing shall conform to the applicable provisions of ASTM C 67. Units meeting the definition of "effloresced" will be subject to rejection.

3.18.4 Prism Tests

At least one prism test sample shall be made for each 465 square meters of wall but not less than three such samples shall be made for any building. Three prisms shall be used in each sample. Prisms shall be tested in accordance with ASTM E 447. Seven-day tests may be used provided the relationship between the 7- and 28-day strengths of the masonry is established by the tests of the materials used. Compressive strength shall not be less than 10.34 MPa at 28 days unless otherwise noted on the contract drawings for specific buildings. If the compressive strength of any prism falls below the specified value by more than 3.5 MPa, steps shall be taken to assure that the load-carrying capacity of the structure is not jeopardized. If the likelihood of low-strength masonry is confirmed and computations indicate that the load-carrying capacity may have been significantly reduced, tests of cores drilled, or prisms sawed, from the area in question may be required. In such case, three specimens shall be taken for each prism test more than 3.5 MPa below the specified value. Masonry in the area in question shall be considered structurally adequate if the average compressive strength of three specimens is equal to at least 85 percent of the specified value, and if the compressive strength of no single specimen is less than 75 percent of the specified value. Additional

testing of specimens extracted from locations represented by erratic core
or prism strength test results shall be permitted.

-- End of Section --

SECTION 10430

EXTERIOR SIGNAGE

PART 1 GENERAL

1.1 GENERAL

All exterior signage shall be provided by a single manufacturer. Exterior signage shall be of the design, detail, sizes, types, and message content shown on the drawings, shall conform to the requirements specified, and shall be provided at the locations indicated. Signs shall be complete with lettering, framing as detailed, and related components for a complete installation.

All signage described herein are applicable for buildings in Leschi Town only and are not applicable for buildings in Range 17 and 32. See Appendix "A" at the end of this section for exterior signage required for buildings in Range 17 and 32.

1.2 CHARACTER PROPORTIONS AND HEIGHTS

Letters and numbers on indicated signs for handicapped-accessible buildings shall have a width-to-height ratio between 3:5 and 1:1 and a stroke-width-to-height ratio between 1:5 and 1:10. Characters and numbers on indicated signs shall be sized according to the viewing distance from which they are to be read. The minimum height is measured using an upper case letter "X". Lower case characters are permitted.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Approved Detail Drawings; G

Drawings showing elevations of each type of sign; dimensions, details, and methods of mounting or anchoring; shape and thickness of materials; and details of construction. A schedule showing the location, each sign type, and message shall be included.

SD-03 Product Data

Modular Exterior Signage System; G

Manufacturer's descriptive data and catalog cuts.

Installation; G

Manufacturer's installation instructions and cleaning

instructions.

Exterior Signs; G

Exterior signage schedule in electronic media with spread sheet format. Spread sheet shall include sign location, sign type, and message.

SD-04 Samples

Exterior Signs; G

One 300 mm length of framing for signs. One sample of each type of sign. Each sample shall consist of a complete sign panel with letters and symbols. Samples may be installed in the work, provided each sample is identified and location recorded. Two samples of manufacturer's standard color chips for each material requiring color selection and 305 mm (12 inch) square sample of sign face color sample.

SD-10 Operation and Maintenance Data

Protection and Cleaning; G

Six copies of maintenance instructions listing routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guides. The instructions shall include simplified diagrams for the equipment as installed.

1.4 QUALIFICATIONS

Signs, plaques, and dimensional letters shall be the standard product of a manufacturer regularly engaged in the manufacture of the products. Items of equipment shall essentially duplicate equipment that has been in satisfactory use at least 2 years prior to bid opening.

1.5 DELIVERY AND STORAGE

Materials shall be wrapped for shipment and storage, delivered to the jobsite in manufacturer's original packaging, and stored in a clean, dry area in accordance with manufacturer's instructions.

1.6 WARRANTY

Manufacturer's standard performance guarantees or warranties that extend beyond a one year period shall be provided.

1.7 Building Addresses

Building address signs shall be of the type available from commercial building supply stores such as *Lowes*, *The Home Depot* or *Builders' Square* or others.

PART 2 PRODUCTS

2.1 MODULAR EXTERIOR SIGNAGE SYSTEM

Exterior signage shall consist of a system of coordinated directional, identification, and regulatory type signs located where shown. Dimensions,

details, materials, message content, and design of signage shall be as shown.

2.1.1 Free-Standing Base Mount Pylon/Monolith Type Signs

2.1.1.1 Framing

Interior framing shall consist of aluminum or galvanized steel tube columns welded to companion plates. Perimeter framing shall consist of aluminum or steel angle framing welded to the post and plate system as designed. Mounting shall be provided per manufacturer recommendation. Framing members of steel shall be finished with semi-gloss baked enamel or two-component acrylic polyurethane. Openings shall be sealed from moisture and made tamper-proof.

2.1.1.2 Exterior Sheeting Panels

Modular panels shall be provided in sizes shown on drawings. Panels shall be fabricated a minimum of 2.3 mm (0.090 inch) thick aluminum. Panels shall be heliarc welded to framing system. Top and end panels shall be removable and shall be secured by 5 mm (3/16 inch) socket head jack nuts. Finish for metal panels shall be semi-gloss baked enamel.

2.1.1.3 Mounting

Mounting shall be provided by securing to concrete foundation as shown.

2.1.1.4 Finishes

Base finish shall be semi-gloss baked enamel

2.1.2 Panel And Post/Panel Type Signs

2.1.2.1 Panels

Modular message panels shall be provided in sizes shown on drawings. Panels shall be fabricated a minimum of 2.0 mm aluminum. Panels shall be designed to be interchangeable panels shall be ~~heliarc welded to framing system~~ secured into metal frames as recommended by the manufacturer.

2.1.2.2 Mounting

Removable mounting shall be provided by an aluminum sleeve embedded in concrete as as recommended by manufacturer.

2.2 GRAPHICS FOR EXTERIOR SIGNAGE SYSTEMS

2.2.1 Graphics

Message letters shall be cut out from panel. Panel cutouts shall be backed with 2.0 mm FRP where cutouts occur.

2.2.2 Messages

See drawings for message content. Typeface: as indicated.

2.3 DIMENSIONAL BUILDING LETTERS

Letters shall be packaged for protection until installation.

2.3.1 Typeface

Typeface shall be as indicated.

2.3.2 Size

Letter size shall be as indicated.

2.3.3 Mounting

Threaded studs of number and size as recommended by manufacturer, shall be used for concealed anchorage. Letters which project from the building line shall have stud spacer sleeves. Letters, studs, and sleeves shall be of the same material. Templates for mounting shall be supplied.

2.4 ALUMINUM ALLOY PRODUCTS

Aluminum alloy products shall conform to ASTM B 209M (ASTM B 209) for sheet or plate, ASTM B 221M (ASTM B 221) for extrusions and ASTM B 26/B 26M or ASTM B 108 for castings. Aluminum extrusions shall be provided at least 3 mm (1/8 inch) thick and aluminum plate or sheet at least 16 gauge thick. Welding for aluminum products shall conform to AWS C1.1.

2.5 ANODIC COATING

Anodized finish shall conform to AA DAF-45 as follows:

Clear (natural) designation AA-M10-C22-A31, Architectural Class II 0.010 mm (0.4 mil) or thicker.

2.6 ORGANIC COATING

Surfaces shall be cleaned, primed, and given a semi-gloss baked enamel or finish in accordance with NAAMM AMP 505 with total dry film thickness not less than 0.030 mm. (1.2 mils.)

2.7 STEEL PRODUCTS

Structural steel products shall conform to ASTM A 36/A 36M. Sheet and strip steel products shall conform to ASTM A 570/A 570M. Welding for steel products shall conform to AWS D1.2.

2.8 VINYL SHEETING FOR GRAPHICS

Vinyl sheeting shall be 5 to 7 year premium type and shall be in accordance with the flammability requirements of ASTM E 84 and shall be a minimum 0.08 mm film thickness. Film shall include a precoated pressure sensitive adhesive backing, Class 1, or positionable pressure sensitive adhesive backing, Class 3.

2.9 ACRYLIC SHEET

Acrylic sheet shall be in accordance with the flammability requirements of ASTM E 84 and shall conform to ANSI Z97.1.

2.10 POLYCARBONATE SHEET

Polycarbonate sheet shall conform to SAE AMS 3611.

2.11 ANCHORS AND FASTENERS

Exposed anchor and fastener materials shall be compatible with metal to which applied and shall match in color and finish and shall be non-rusting, non-corroding, and non-staining. Exposed fasteners shall be tamper-proof.

2.12 SHOP FABRICATION AND MANUFACTURE

2.12.1 Factory Workmanship

Work shall be assembled in the shop, as far as practical, ready for installation at the site. Work that cannot be shop assembled shall be given a trial fit in the shop to ensure proper field assembly. Holes for bolts and screws shall be drilled or punched. Drilling and punching shall produce clean, true lines and surfaces. Welding to or on structural steel shall be in accordance with AWS D1.1. Welding shall be continuous along the entire area of contact. Exposed welds shall be ground smooth. Exposed surfaces of work shall have a smooth finish and exposed riveting shall be flush. Fastenings shall be concealed where practical. Items specified to be galvanized shall be by hot-dip process after fabrication if practical. Galvanization shall be in accordance with ASTM A 123/A 123M and ASTM A 653/A 653M, as applicable. Other metallic coatings of steel sheet shall be in accordance with ASTM A 924/A 924M. Joints exposed to the weather shall be formed to exclude water. Drainage and weep holes shall be included as required to prevent condensation buildup.

2.12.2 Dissimilar Materials

Where dissimilar metals are in contact, or where aluminum is in contact with concrete, mortar, masonry, wet or pressure-treated wood, or absorptive materials subject to wetting, the surfaces shall be protected with a coat of asphalt varnish or a coat of zinc-molybdate primer to prevent galvanic or corrosive action.

2.12.3 Shop Painting

Surfaces of miscellaneous metal work, except nonferrous metal, corrosion resisting steel, and zinc-coated work, shall be given one coat of zinc-molybdate primer or an approved rust-resisting treatment and metallic primer in accordance with manufacturer's standard practice. Surfaces of items to be embedded in concrete shall not be painted. Upon completion of work, damaged surfaces shall be recoated.

2.13 COLOR, FINISH, AND CONTRAST

Color of products shall be as directed by appropriate government authority.. For buildings required to be handicapped-accessible, the characters and background of signs shall be eggshell, matte, or other non-glare finish. Characters and symbols shall contrast with their background - either light characters on a dark background or dark characters on a light background.

2.14 Building Addresses

There are several types and styles of address lettering available. There are sticky-backed press-on, nail-on in both wood and metal, and there are various sizes and colors. All may be used on the Leschi Town.

PART 3 EXECUTION

3.1 INSTALLATION

Signs, plaques, or dimensional letters shall be installed in accordance with approved manufacturer's instructions at locations shown on the approved detail drawings. Circuits installed underground shall conform to the requirements of Section 16375 ELECTRICAL DISTRIBUTION SYSTEM, UNDERGROUND. Steel conduits installed underground and signage mounted directly on buildings shall be in conformance with the requirements of Section 16415 ELECTRICAL WORK, INTERIOR. Signs shall be installed plumb and true at mounting heights indicated, and by method shown or specified. Signs mounted on other surfaces shall not be installed until finishes on such surfaces have been completed.

3.1.1 Anchorage

Anchorage and fastener materials shall be in accordance with approved manufacturer's instructions for the indicated substrate. Anchorage not otherwise specified or indicated shall include slotted inserts, expansion shields, and powder-driven fasteners when approved for concrete; toggle bolts and through bolts for masonry; machine carriage bolts for steel; lag bolts and screws for wood.

3.1.1.1 Building Addresses

Leschi Town buildings represent a community of homes, apartments and small businesses. The contractor shall assure each individual building receive the same style, size and color and each building receives a different style of numbers than the adjacent buildings such that the addresses are random styles, sizes and colors throughout the entire project. Addresses are listed in Appendix "A" at the end of this section.

3.1.2 Protection and Cleaning

The work shall be protected against damage during construction. Hardware and electrical equipment shall be adjusted for proper operation. Glass, frames, and other sign surfaces shall be cleaned in accordance with manufacturer's instructions. After signs are completed and inspected, the Contractor shall cover all project identification, directional, and other signs which may mislead the public. Covering shall be maintained until instructed to be removed by the Contracting Officer or until the facility is to be opened for business. Signs shall be cleaned, as required, at time of cover removal.

3.2 FIELD PAINTED FINISH

Miscellaneous metals and frames shall be field painted in accordance with Section 09900 PAINTING, GENERAL. Anodized metals, masonry, and glass shall be protected from paint. Finish shall be free of scratches or other blemishes.

APPENDIX "A"

23rd INFANTRY WAY

Building
 1000 MUNICIPAL BUILDING
 1003 THREE STORY OFFICE BLDG (Option)
 1005 TOWN HALL
 1007 POLICE STATION
 1009 FIRE STATION
 1003 GUARD SHACK

I CORPS BLVD

2103 BANK
 2105 POST OFFICE
 2209 CHURCH
 3501 RESIDENCE TYPE "A"
 3503 RESIDENCE TYPE "A"

20th INFANTRY WAY

2001 HOTEL
 2003 FIVE STORY OFFICE BUILDING
 2007 THREE STORY OFFICE BUILDING

1st SPECIAL FORCES BLVD

1213 OPEN AIR MARKET
 2202 POST OFFICE (Option)
 3301 RETAIL
 3303 CLINIC
 3309 SCHOOL
 6301 FARM

24th INFANTRY WAY

Building
 5101 POWER STATION
 6001 JUNKYARD OFFICE
 6003 BULK FUEL STATION
 6007 WAREHOUSE "A"
 6105 WAREHOUSE "B"
 6103 RADIO STATION

ARROWHEAD WAY

5003 TOWNHOUSE (Option)
 5005 RETAIL (Option)
 5007 TOWN HALL (Option)
 5009 RETAIL (Option)

SUA SPONTE CIRCLE

(RESIDENCES CLOCKWISE
 FROM SOUTH):
 3201 TYPE "C"
 3203 TYPE "C"
 3205 TYPE "D"
 3207 TYPE "B"
 3209 TYPE "B"
 3211 TYPE "D"
 3213 TYPE "C"

GARRISON AREA

5201 HEADQUARTERS
 5202 SHOWER/LATRINE
 5203 BARRACKS
 5204 MESS/SUPPLY
 5205 BARRACKS
 5206 BARRACKS
 5207 GUARD SHACK
 5208 BARRACKS

-- End of Section --

SECTION 13121

PREENGINEERED METAL BUILDINGS

PART 1 GENERAL: Preengineered metal buildings are to be installed at Ranges 17 and 32 and at Leschi Town. Pre Manufactured Guard Shacks are to be installed at several locations in Leschi Town.

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

THE ALUMINUM ASSOCIATION, INCORPORATED (AA)

AA 30 (1986) Aluminum Structures, Construction Manual Series Section 1

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC FCD (1990) Quality Certification Program Description

AISC S329 (1985) Allowable Stress Design Specification for Structural Joints Using ASTM A 325 or A 490 Bolts

AISC S335 (1989) Structural Steel Buildings Allowable Stress Design and Plastic Design

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE 7 (1988) Minimum Design Loads for Buildings and Other Structures

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 36/A 36M (1996) Carbon Structural Steel

ASTM A 500 (1993) Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes

ASTM A 529/A 529M (1994) High-Strength Carbon-Manganese Steel of Structural Quality

ASTM A 572/A 572M (1994; Rev. C) High-Strength Low-Alloy Columbium-Vanadium of Structural Steel

ASTM A 588/A 588M (1994) High-Strength Low-Alloy Structural Steel with 50 ksi (345 MPa) Minimum Yield Point to 4 in. (100 mm) Thick

ASTM A 653/A 653M (1996) Sheet Steel, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

ASTM A 755/A 755M (1995) Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products

ASTM A 792/A 792M (1996) Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot Dip Process

ASTM B 117 (1995) Operating Salt Spray (Fog) Apparatus

ASTM B 209M (1995) Aluminum and Aluminum-Alloy Sheet and Plate (Metric)

ASTM B 221M (1996) Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric)

ASTM C 236 (1989; R 1993) Steady-State Thermal Performance of Building Assemblies by Means of a Guarded Hot Box

ASTM C 308 (1995) Working, Setting, and Service Strength Setting Times of Chemical-Resistant Resin Mortars

ASTM D 522 (1993; Rev. A) Mandrel Bend Test of Attached Organic Coatings

ASTM D 523 (1989; R 1994) Specular Gloss

ASTM D 828 (1993) Tensile Properties of Paper and Paperboard Using Constant-Rate-of-Elongation Apparatus

ASTM D 968 (1993) Abrasion Resistance of Organic Coatings by Falling Abrasive

ASTM D 2244 (1993) Calculation of Color Differences from Instrumentally Measured Color Coordinates

ASTM D 2247 (1994) Water Resistance of Coatings in 100 Percent Relative Humidity

ASTM D 2794 (1993) Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)

ASTM D 3359 (1995; Rev. A) Measuring Adhesion by Tape Test

ASTM D 3841 (1992) Glass-Fiber-Reinforced Polyester Plastic Panels

ASTM D 4214 (1989) Evaluating Degree of Chalking of Exterior Paint Films

ASTM E 84 (1997; Rev. A) Surface Burning Characteristics of Building Materials

ASTM E 96	(1995) Water Vapor Transmission of Materials
ASTM G 23	(1996) Operating Light-Exposure Apparatus (Carbon-Arc Type) with and Without Water for Exposure of Nonmetallic Materials
AMERICAN WELDING SOCIETY, INC. (AWS)	
AWS D1.1	(1996) Structural Welding Code - Steel
METAL BUILDING MANUFACTURERS ASSOCIATION (MBMA)	
MBMA LRMBSM	(1986; Supp. 1990) Low Rise Metal Building Systems Manual
STEEL DECK INSTITUTE (SDEI)	
SDEI DDM	(1990) Diaphragm Design Manual
STEEL WINDOW INSTITUTE (SWI)	
SWI SGSW	(1989) Specifier's Guide to Steel Windows
UNDERWRITERS LABORATORIES INC. (UL)	
UL 580	(1994; R 1997) Uplift Resistance of Roof Assemblies

1.2 DESCRIPTION OF BUILDING

1.2.1 Dimensions

Building dimensions shall be as standard with manufacturer, not less than those indicated, but exceeding the indicated dimensions only by the amount of the closest standard size thereto. Eave height shall be measured from the top of finished floor to intersection of insides of roof and sidewall sheets. The clear height between finished floor and bottom of roof steel shall be as indicated.

1.2.2 Framing

Provide building with vertical walls and gable roof. Building shall be single-span structures with one of the following framing systems: self-framing, column with single-span or continuous trusses, continuous beam frames, column with rigid frame, or rigid frame type, similar to AISC S335, Type I construction. End walls shall be of beam and column design. Roof slope shall be as per the contract drawings. Design framed openings structurally.

1.2.3 Foundation Requirements

Design foundations for allowable soil bearing pressure and a minimum bottom of footing depth as indicated. Use of hairpin ties to resist lateral loads will not be permitted. Use a factor of safety of 1.5 for overturning, sliding and uplift, and a concrete compressive strength as specified in Section 03300, "Cast-In-Place Structural Concrete." The foundation loads are supplied by the building manufacturer.

1.3 EXPERIENCE

1.3.1 Manufacturer

The manufacturer shall have AISC FCD, category MB certification.

1.3.2 Installer

Erector shall have specialized experience in the erection of metal building systems for a period of at least 3 years.

1.3.3 Pre Manufactured Guard shacks

Guard shacks shall be procured from a manufacturer, or manufacturers, specializing in such structures and having been actively engaged in such manufacture for at least the immediate past five years. The Manufacturer, or each manufacturer, shall have a representative on site coincidental to each of their product's installations to inspect and verify correctness of each unit's installation.

1.4 DESIGN REQUIREMENTS

MBMA LRMBSM, for loading combinations and definitions with the exceptions of wind load and special collateral loads. Design for each material shall be as specified by the Design Authority as listed in MBMA LRMBSM.

1.4.1 Roof Dead, Live, and Snow Loads

As indicated.

1.4.2 Wind Loads

Compute and apply wind pressures, ASCE 7. Basic wind speed and multiplying factors are as indicated.

1.4.3 Seismic Loads

As required for Seismic Zone indicated.

1.4.4 Collateral Loads

As indicated.

1.4.5 Deflection

1.4.5.1 Structural Members

The maximum deflection of main framing members shall not exceed 1/240th of their respective spans. The maximum deflection due to live load in roof panels and purlins shall not exceed 1/180th of their respective spans.

1.4.5.2 Roof Panels

UL 580, Class 90. The design analysis shall establish that the roof when deflected under dead plus live or snow loads, will not result in a negative gradient. Maximum deflections shall be based on sheets continuous across two or more supports with sheets unfastened and fully free to deflect. In addition, the roof decking shall be designed for a 90 kg concentrated load

at midspan on a 300 mm wide section of deck. Panels thinner than 0.8 mm are not permitted for diaphragms used to resist seismic loads in Seismic Zones 2 through 4.

1.4.5.3 Wall panels

The maximum deflection due to wind on wall panels and girts shall be limited to 1/120th of their respective spans except that when interior finishes are used the maximum allowable deflection shall be limited to 1/180th of their respective spans.

1.4.5.4 Openings

Limit deflections of steel framing above and along the side of rolling door openings to a maximum of 1/2 the allowable movement in the telescoping top roller of the doors to ensure proper operation. Frame all equipment openings over 300 by 300 mm.

1.5 SUBMITTALS

Submit the following in accordance with Section 01330, "Submittal Procedures."

SD-02 Shop Drawings

Preengineered building; G

Template for anchor bolts

Submit as necessary to erect the building and install components.

SD-03 Product Data

Preengineered metal building materials

Submit sufficient data indicating conformance to specified requirements on materials provided under this section.

SD-04 Samples

Factory color finish

Submit one sample of each color indicated for verification that the color matches the colors indicated. Where colors are not indicated, submit not less than four different samples of manufacturer's standard colors for selection by the Contracting Officer.

SD-05 Design Data

Building; FIO

Foundation loads; G

Anchor bolts; G

Purlins and girts; G

Bracing; G

SD-06 Test Reports

Factory Color Finish

Insulation

SD-07 Certificates

Preengineered metal building materials

Submit certificates attesting that materials comply with this specification.

SD-10 Operation and Maintenance Data

Preengineered Building, data package 1

Submit operation and maintenance data in accordance with Section 01701, "Operations and Maintenance Manuals."

1.6 DELIVERY, STORAGE, AND HANDLING

Deliver, store, and handle manufactured items so that materials remain dry and undamaged. Do not store in contact with materials that might cause staining.

1.7 WARRANTY

Provide warranty against water leaks arising out of or caused by ordinary wear and tear by the elements for a period of 20 years. Such warranty shall start upon final acceptance of the work or the date the Government takes possession, whichever is earlier.

1.8 QUALITY ASSURANCE

1.8.1 Drawings: Preengineered Building

Submit complete design drawings for the preengineered building. Submit drawings for the foundations and anchorage.

1.8.2 Design Data: Building

Submit design calculations for the entire preengineered building and foundations, prepared and stamped by a professional engineer. Also submit for components requested, and stamp with the seal of a professional engineer. Include sizes and location of anchor bolts.

PART 2 PRODUCTS

2.1 WALL AND ROOF MATERIALS

MBMA LRMBSM except as specified otherwise herein. Design roof and wall panels, accessories, and flashings to be completely weathertight and free of abrasions, loose fasteners, and deformations.

2.1.1 Minimum Thickness

As required to conform to design requirements but not less than the

following:

Items	Minimum Thickness (Uncoated)
Steel Structural Members	18 Manufacturer's Standard (MFG STD)
Other Than Roof and Wall Panels	gage, 1.2 mm
Roof and Wall Panels	
Steel	26 MFG STD gage, 0.5 mm
Aluminum	0.8 mm
Plastic	1.1 mm
Gable and Eave Trim, Fascia Closure Strips, Rake Flashings, Copings, and Liner Panels	
Steel	26 MFG STD gage, 0.5 mm
Aluminum	0.8 mm
Plastic	1.1 mm
Eave Gutters and Downspouts	
Steel	26 MFG STD gage, 0.5 mm
Aluminum	0.8 mm
Roof Ventilators	
Steel	26 MFG STD gage, 0.5 mm
Aluminum	0.8 mm
Louvers	
Steel	18 MFG STD gage, 1.2 mm
Aluminum	1.6 mm
Girders and Columns	5 mm
Purlins and Girts	14 Manufacturer's Standard gage (MFG STD)
Roof Panels	
Steel	22 MFG STD gage
Aluminum	1 mm
Wall Panels	
Steel	24 MFG STD gage
Aluminum	0.8 mm
Bracing	5 mm thick steel members
Column Base Plates	16 mm thick
Column Anchor Bolts	16 mm diameter
Cable and Eave Trim, Fascia Closure Strips, Rake Flashings, Copings, and Liner Panels	
Steel	24 MFG STD gage
Aluminum	0.8 mm
Plastic	1.1 mm
Eave Gutters and Downspouts	
Steel	24 MFG STD gage
Aluminum	0.8 mm

Items	Minimum Thickness (Uncoated)
Louvers	
Steel	18 MFC STD gage
Aluminum	1.6 mm

2.1.2 Panels

- a. Fabricated of aluminum/zinc-coated steel .
- b. Preformed.
- c. Factory-insulated to provide weathertight joint upon installation, with:
 - (1) Inner and outer sheets formed and joined at edges into a tongue-and-groove joining system with vinyl seals, closed cell foam tape, or factory-applied nonskinning butyl sealant ; or
 - (2) Outer sheet designed to overlap adjacent panel a minimum of one configuration.
- d. If designed as diaphragm, roof decks shall be designed in accordance with SDEI DDM.
- e. For standing seam roofs, Section 07416, "Structural Standing Seam Metal Roof (SSSMR)."

Insulation in the cores of the panels shall be asbestos-free composition and provide an overall "U" value of not more than 0.10 for wall panels and 0.05 for roof panels. Insulation in factory-insulated panels shall have a flame spread rating of 75 or less and a smoke development factor of 150 or less. Panels over 30 feet in length shall be designed for thermal expansion and contraction.

2.1.2.1 Zinc-Coated Steel Sheet

ASTM A 755/A 755M, Coating Class Z 350 or ASTM A 653/A 653M, SQ, Grade 33, Coating Class Z 350.

2.1.2.2 Aluminum/Zinc-Coated Steel Sheet

ASTM A 792/A 792M, AZ 55

2.1.2.3 Aluminum Sheet

Alloy 3004 Alclad conforming to ASTM B 209M.

2.1.2.4 Liner Panels

Formed of same type material as used for wall panels to closely approximate configuration of panels indicated.

2.2 FRAMING AND STRUCTURAL MEMBERS

2.2.1 Steel

ASTM A 36/A 36M, ASTM A 529/A 529M, ASTM A 572/A 572M, or ASTM A 588/A 588M.

2.2.2 Aluminum

ASTM B 221M or ASTM C 308.

2.2.3 Structural Tube

ASTM A 500 or ASTM B 221M.

2.3 MISCELLANEOUS ITEMS

2.3.1 Caps, Strips, and Plates

Form ridge caps, eave and edge strips, fascia strips, miscellaneous flashings, and miscellaneous sheet metal accessories from the same material and gage as the roof panels. Wall plates, base angles or base channels, and other miscellaneous framing members may be standard structural steel shapes, or may be formed from steel not lighter than 1.2 mm thick.

2.3.2 Closure Strips

Provide closure strips of closed-cell or solid-cell synthetic rubber or neoprene, or polyvinyl chloride premolded to match configuration of the covering. Closure strips shall not absorb or retain water.

2.3.3 Sealant

Provide elastomeric type sealant containing no oil or asphalt. Exposed sealant shall cure to a rubberlike consistency. Concealed sealant may be the nonhardening type.

2.3.4 Gaskets and Insulating Compounds

Provide nonabsorptive gaskets and insulating compounds suitable for insulating contact points of incompatible materials. Insulating compounds shall be nonrunning after drying.

2.3.5 Moveable Partitions for AAR Building

The pre-engineered building manufacturer is responsible for the design and for providing the material necessary to support the moveable partitions shown on the plans. The weight of the partitions shall be obtained from the partition supplier for the actual system proposed.

2.3.6 Catwalk Framing for Warehouse "A" Building

The pre-engineered building manufacturer is responsible for the design and for providing the material necessary to construct the catwalk and mechanical platform shown on the plans.

2.3.7 Fasteners

Provide fasteners for steel wall and roof panels of zinc-coated steel, aluminum, corrosion resisting steel, or nylon capped steel, type and size specified below or as otherwise approved for the applicable requirements. Fasteners for aluminum wall and roof panels shall be aluminum or corrosion resisting steel. Fasteners for structural connections shall provide both tensile and shear strength of not less than 3.3 kN per fastener. Fasteners

for accessories shall be the manufacturer's standard. Exposed roof fasteners shall be gasketed or have gasketed washers on the exterior side of the covering to waterproof the fastener penetration. Washer material shall be compatible with the covering; have a minimum diameter of 10 mm for structural connections; and gasketed portion of fasteners or washers shall be neoprene or other equally durable elastomeric material approximately 3 mm thick. When wall covering is factory color finished, exposed wall fasteners shall be color finished or provided with plastic color caps to match the covering. Nonpenetrating fastener system using concealed clips shall be manufacturer's standard for the system provided.

2.3.7.1 Screws

Provide self-tapping screws not less than No. 14 diameter and not less than No. 12 diameter if self-drilling/self-tapping type.

2.3.7.2 End-Welded Studs

Provide automatic shouldered type studs with a shank diameter of not less than 5 mm and cap or nut for holding covering against the shoulder.

2.3.7.3 Blind Rivets

Provide aluminum rivets with 5 mm nominal diameter shank or stainless steel rivets with 3 mm nominal diameter shank. Rivets shall be threaded stem type if used for other than the fastening of trim. Provide hollow stem rivets with closed ends.

2.3.7.4 Bolts

Provide bolts not less than 6 mm diameter, shouldered or plain shank as required, with nuts.

2.4 GUTTERS

Provide complete with mitered corners, end pieces, and special pieces that may be required. Expansion-type slip joints shall be provided at the center of the runs and at intervals of not more than 9800 mm for aluminum and not more than 12 200 mm for steel. Provide water tight seal at all other joints. Provide gutters below the slope line of the roof, to allow snow and ice to slide clear. Provide hangers and fastenings from a metal compatible with the gutters. Space hangers not more than 900 mm apart.

2.5 DOWNSPOUTS

Provide cross sectional area not less than the size of gutter indicated and complete including elbows and offsets. Provide downspouts in approximately 3000 mm lengths; end joints shall telescope not less than 12 mm, and longitudinal joints shall be locked. Provide gutter outlets with stainless steel wire ball strainers of a standard type. Position downspouts not less than 12 mm away from walls and fasten to the walls at top, bottom, and at not to exceed 1500 mm centers intermediately between with manufacturer's standard type leader straps, or concealed type fasteners. Form straps and fasteners from a metal compatible with the downspouts.

2.6 CIRCULAR ROOF VENTILATORS

Provide circular roof ventilators fabricated of aluminum or zinc-coated steel with the same finish specified in paragraph entitled "Finish," color

as indicated, furnished with removable bird and insect screens and chain or cable operated dampers. Provide rigid weathertight ventilators free from vibration upon installation.

2.7 CONTINUOUS (RIDGE) ROOF VENTILATORS

Provide ventilators fabricated of aluminum, zinc-coated steel, or aluminum-zinc alloy coated steel, of the same finish specified in paragraph entitled "Finish," color as indicated, complete with braces, , and bird screening. Provide ventilators in sections 2400 or 3000 mm long, braced at midlength. Join sections together with splice plates of the same material as the sections. Provide end closures for each section.

2.8 LOUVERS

Provide louvers and frames of the sizes, design, and color indicated. Provide the same finish specified in paragraph entitled "Finish". Fold or bead blades at the edges, set at an angle to exclude driving rains, and secure to the frames by riveting or welding as standard with manufacturer. Provide mullions for louvers over 1200 mm in width; provide not less than one mullion for each 1200 mm width. Provide flanges on the interior face of frames where air intakes or exhaust louvers are indicated to be connected with mechanically-operated dampers or metal ductwork. Provide woven wire bird screening, not less than 8.5 by 8.5 mm mesh per square meter in rewirable frames, on the interior of louvers; install screen frames by means of clips to allow easy removal for cleaning and rewiring. The screens and frames shall be of the same type metal as the louvers; screen wire shall be not less than 1.2 mm in diameter.

2.9 PLASTIC WALL LIGHTS

ASTM D 3841, Type II, Grade 1, weighing not less than 2.4 kg per square meter, standard with the manufacturer. Size and color as indicated. Provide wall lights of the same configuration as the metal wall panels.

2.10 FIELD INSTALLED INSULATION

The metal buildings located at Ranges 17 and 32 shall be insulated. Those located in Leschi Town will not be insulated.

Blanket type 9.6 kg per cubic m fiber-glass as standard with the metal building manufacturer having a factory-applied facing on one side and a permeance rating of 0.05 or less when tested in accordance with ASTM E 96.

- a. Facing on insulation shall be vinyl-scrim foil. Vinyl-scrim foil shall have a tensile strength of not less than 178 N machine direction and 134 N cross machine direction when tested in accordance with ASTM D 828.
- b. The insulation, including facings, shall have a flame spread rating of 75 or less and a smoke development factor of 150 or less when tested in accordance with ASTM E 84.
- c. Wall insulation shall have guarded hot box values for "R" of 19 or more as measured in accordance with ASTM C 236 test method. Roof insulation shall have guarded hot box values for "R" of 30 or more as measured in accordance with ASTM C 236.
- d. Provide insulation containing 20 percent or greater recovered

material which has been diverted from solid waste, but not including material reused in a manufacturing process. Where two materials have the same price and performance, provide the one containing the higher recovered material content.

2.11 DOORS AND WINDOWS

Doors and windows are specified in Sections 08210 and 08510. Provide framing members and flashings as necessary for installation of the doors and windows.

2.11.1 Sliding Doors

Sheet metal type. Sheet metal type shall consist of steel framework covered with siding of the same type and finish as used for the building. Provide hardware necessary for the complete installation of sliding doors. Sliding door hardware shall include heavy-duty zinc-coated steel tracks, brackets, end and center stops, not less than two-wheel ball or roller bearing, adjustable type hangers - two per leaf, binders, guides, handles, heavy type cane bolt and socket for one leaf of pairs of doors, padlock eyes or heavy safety hasp, and flashing for outside door tracks. Hardware items shall be approved types, standard with the door manufacturer.

2.11.2 Steel Windows

Steel Windows: SWI SGSW, standard intermediate casement type. Provide manufacturer's standard factory finish. Provide ventilating sections with insect screens. Provide factory glazed windows with laminated polycarbonate glass for the Range 17 buildings only. In Leschi Town provide window frames only without any glazing.

2.12 CANOPIES

The canopy shown on the AAR Building and Workshop building at Range 17 shall be extensions of the buildings roof made of same materials and with the same finish as the building. Soffit materials shall be of perforated material specifically designed for use as soffit panels otherwise matching the exterior wall panels of the buildings in color and appearance.

2.13 FINISH

2.13.1 Shop Painting

Ferrous metal work, except factory-finished work, zinc-coated work, aluminum-coated work, and work specified to be painted herein, shall be (1) cleaned of dirt, rust, scale, loose particles, grease, oil, and other deleterious substances; (2) phosphate treated; and (3) then be given one coat of an approved rust-inhibiting primer paint of the type standard with the metal building manufacturer.

2.13.2 Factory Color Finish

Provide exterior and interior exposed surfaces of metal roof and wall panels, roof ventilators, louvers, gutters, downspouts, and metal accessories with a thermal-cured factory finish. Color shall be selected from manufacturer's standard colors. Provide an exterior finish top coat of the building manufacturer's standard paint. Provide standard dry film thickness of 0.025 mm for exterior coating exclusive of primer. Provide exterior primer thickness standard with building manufacturer. Interior

color finish shall consist of the same coating and dry film thickness as the exterior. Provide interior and exterior color finish meeting the test requirements specified below. Tests shall have been performed on the same factory finish and thickness provided.

- a. Salt Spray Test: ASTM B 117, minimum 1000 hours. Undercutting of the paint film from the score line shall not exceed 2 mm.
- b. Accelerated Weathering Test: ASTM G 23, Method 2, Type D apparatus minimum 2000 hours or Type EH apparatus minimum 500 hours, no checking, blistering or loss of adhesion; color change less than 5 NBS units by ASTM D 2244 and chalking less than No. 8 rating by ASTM D 4214.
- c. Flexibility: ASTM D 522, Method A, 3 mm diameter, 180 degree bend, no evidence of fracturing to the naked eye.
- d. Adhesion: ASTM D 3359, Method B, for laboratory test and film thickness less than 0.01 mm and Method A for site tests. There shall be no film removed by tape applied to 11 parallel cuts spaced 3 mm apart plus 11 similar cuts at right angles.
- e. Impact: ASTM D 2794, no loss of adhesion after direct and reverse impact equal to 1.5 times metal thickness in mm, expressed in m-kg.
- f. Humidity Resistance: ASTM D 2247, 1000 hours, no signs of blistering, cracking, creepage or corrosion on score panel.
- g. Specular Gloss: ASTM D 523, finished surfaces exposed to the building exterior shall have a specular gloss of 10 measured at an angle of 85 degrees.
- h. Abrasion: ASTM D 968, Method A, falling sand shall not expose substrate when tested in quantities 30-40 liters of sand per 0.03 mm of thickness.

2.14 Pre Manufactured Guard Shacks

At several locations around Leschi Town there are small guard shacks. These shall be pre-manufactured metal buildings designed and built for outdoor use. They shall have "front" and "side" windows making a three sided open building "front". The Contracting Officer's Representative will designate which side is the "front" orientation for each guard shack prior to Contractor's final procurement of these buildings. Windows shall be framed, but the glazing shall be omitted. There shall be one personnel door, the leaf of which shall be not less than 2133 mm (7 feet) high x 914 mm (3 feet) wide. A 1220 x 1220 x 102 mm (4 feet x 4 feet x 4 inch) concrete stoop shall be located at each personnel door (centered on the door opening) and immediately adjacent to the buildings foundation. The top surface of this stoop shall be 13 mm (1/2 inch) below the top surface of the foundation slab. The minimum outside dimensions of each of these guard shacks shall be 2743 mm (9 feet) long x 2133 mm (7 feet) wide x 2438 mm (8 feet) tall. There is no requirement for any insulation. These guard shacks shall be centered on and anchored by manufacturer's printed directions to a concrete slab or pad not less than 102 mm (4 inches) thick and not less than the outside dimensions of each guard shack. Each guard shack shall be finished in the manufacturer's standard finish in colors chosen by the Contracting Officer's Representative.

2.15 Communications Hut

Communications hut shall be a prefabricated equipment enclosure as indicated on the drawings, L.E. Hut Model L1125-09/SS or equal, as approved by the Contracting Officer's representative. Communications hut shall be of steel stud construction, gable-roofed with shingles, with a 12.7mm factory-installed exterior and an interior lining of laminated fiberglass. Subbase shall be structural steel with a rodent barrier and lifting/anchor brackets supporting a lightweight concrete floor system with 12.7mm rigid insulation. Floors shall be vinyl floor tile with vinyl baseboard. Walls shall be insulated to R11, and the ceiling shall be insulated to R30. There shall be one personnel door as shown on the drawings.

PART 3 EXECUTION

3.1 INSPECTION

Check concrete dimensions, anchor bolt size and placement, and slab elevation with the metal building manufacturer's templates and drawings before setting any steel.

3.2 ERECTION

Erect in accordance with the manufacturer's approved erection instructions and diagrams. Correct defects and errors in the fabrication of building components in a manner approved by the Contracting Officer. If defects or errors in fabrication of components cannot be corrected, remove and provide nondefective components. When installing wall and roof systems, install closure strips, flashing, sealing material, and other accessories in accordance with building manufacturer's instructions to provide a weathertight system, free of abrasions, loose fasteners, and deformations. After erection is complete, repair and coat abraded and damaged, primed or factory-finished surfaces to match adjacent surfaces.

3.2.1 Dissimilar Materials

Prevent direct contact between aluminum surfaces, and ferrous or other incompatible metals, by one of the following methods:

- a. Paint the incompatible metal with a coating of manufacturer's standard heavy-bodied paint.
- b. Paint the incompatible metal with a prime coat of corrosion inhibitive primer followed by one or two coats of aluminum metal-and-masonry paint, or other suitable protective coating, excluding products containing lead and chromium pigmentation.
- c. Provide an approved nonabsorptive gasket.
- d. Apply an approved calking between the aluminum and the incompatible metal.

If drainage from incompatible metal passes over aluminum, paint the incompatible metal by method (a) or (b). Paint aluminum surfaces in contact with concrete or masonry materials by method (a). Paint green or wet wood, or wood treated with incompatible wood preservatives, by method (a) or use two coats of aluminum paint.

3.2.2 Rigid Frames, Bases, and Sill Members

Brace frames as necessary to ensure safety. Set accurately, using a nonshrink grout to obtain uniform bearing on the concrete and to maintain a level base line elevation. Clean surfaces to receive the mortar and thoroughly moisten immediately before placement of mortar. Water cure exposed surfaces of mortar with wet burlap for 7 days.

3.2.2.1 Field Welding

Steel, AWS D1.1. Aluminum, AA 30.

3.2.2.2 Field Bolting

AISC S329

3.2.3 Wall Construction

Apply panels full wall heights from base to eave with no horizontal joints except at the junctions of door frames, window frames, louver panels, and similar locations. Lay side laps away from the prevailing winds. Seal side and end laps with the joint sealing material recommended by the manufacturer. Flash or seal walls at the base, at the top, around windows, door frames, framed louvers, and other similar openings. Flashing will not be required where approved "self-flashing" panels are used. Minimum end laps for all types of panels shall be 64 mm. Minimum side laps for all types of panels shall be one corrugation, one configuration, or an interlocking joint. Install liner panels to height indicated in Leschi Town and Range 32 buildings only. Range 17 buildings shall have Gypsum Wall Board (GWB) finishes on the interior surfaces of all exterior walls. The AAR Building at Range 17 shall have fibrous resin panels over these GWB finishes.

3.2.4 Roof Construction

The roofs are all structural standing seam metal roofs specified in Section 07416. Apply the roofing panels in full lengths from ridge to eaves with no transverse joints except at the junction of ventilators and similar openings. Lay side laps away from the prevailing wind, and seal side and end laps with joint sealing material. Flash and seal the roof at the ridge, at eaves and rakes, at projections through the roof, and elsewhere as necessary.

3.2.5 Minimum Fastener Spacing

Space fasteners according to manufacturer's instructions, but not to exceed:

- a. 200 mm o.c. at end laps of covering,
- b. 300 mm o.c. at connection of covering to intermediate supports,
- c. 300 mm o.c. side laps of roof coverings, 450 mm o.c. at side laps of wall.

3.2.6 Installation of Insulation

3.2.6.1 Roof Insulation

Install over purlins before roof coverings are applied. Hold insulation rigid until secured in place. Insulation facing shall be exposed on the

interior side of the building. Fold and staple facing tabs of insulation on 150 mm centers, from exterior side of building to completely seal joints. If folding and stapling can only be accomplished from the inside, push the tabs neatly up between the edges of adjoining blankets, and cover side laps of insulation with metal strips formed for this purpose and paint to match the facing material. Install the strips spanning from purlin to purlin and in accordance with the metal building manufacturer's recommendations.

3.2.6.2 Wall Insulation

Install over girts before wall coverings are applied. Hold insulation rigid until secured in place. Expose facing toward the interior side of the building. Fold and staple facing tabs of insulation on 150 mm centers, from exterior side of building, to completely seal joints. If folding and stapling can only be accomplished from the inside, push the tabs neatly up between the edges of adjoining blankets, and cover side laps of insulation with metal strips formed for this purpose and paint to match the facing material. Install the strips spanning from girt to girt and in accordance with the metal building manufacturer's recommendations.

3.2.6.3 Pre Manufactured Guard Shacks

Guard shacks shall be erected square, plumb and true to the sites per their locations shown the civil design site plan of the contract drawings.

3.3 FIELD PAINTING

Immediately upon detection, abraded or corroded spots on shop-painted surfaces shall be wire brushed and touched up with the same color and material used for the shop coat. Section 09900N, "Paints and Coatings," for painting of shop-primed ferrous surfaces exposed on the outside of the building and all shop-primed surfaces of doors and windows.

3.4 FIELD QUALITY CONTROL

At the discretion of the Contracting Officer, sample panels may be taken at random from each delivery or from stockpiles on the site at any time during the construction period, and tests may be made to check the conformance of the materials to the requirements specified in paragraph entitled "Factory Color Finish." Failure of the sample sheets to pass the required tests shall be cause for rejection of all sheets represented by the samples and replacement of the entire shipment.

-- End of Section --

SECTION 13920

FIRE PUMPS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 47/A 47M	(1999) Ferritic Malleable Iron Castings
ASTM A 194/A 194M	(1999) Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High-Temperature Service
ASTM A 795	(1997) Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use
ASTM F 436M	(1993) Hardened Steel Washers (Metric)

ASME INTERNATIONAL (ASME)

ASME B16.5	(1996; B16.5a) Pipe Flanges and Flanged Fittings NPS 1/2 thru NPS 24
ASME B16.39	(1998) Malleable Iron Threaded Pipe Unions Classes 150, 250, and 300

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA EWW	(1999) Standard Methods for the Examination of Water and Wastewater
AWWA B300	(1999) Hypochlorites
AWWA B301	(1992; Addenda B301a - 1999)) Liquid Chlorine
AWWA M20	(1973) Manual: Water Chlorination Principles and Practices

FACTORY MUTUAL ENGINEERING AND RESEARCH (FM)

FM P7825a	(1998) Approval Guide Fire Protection
FM P7825b	(1998) Approval Guide Electrical Equipment

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA MG 1	(1998) Motors and Generators
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NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 20	(1999) Installation of Centrifugal Fire Pumps
NFPA 24	(1995) Installation of Private Fire Service Mains and Their Appurtenances
NFPA 70	(1999) National Electrical Code

~~UNDERWRITERS LABORATORIES (UL)~~

UL 448	(1994; Rev thru May 1999) Pumps For Fire Protection Service
UL Fire Prot Dir	(1999) Fire Protection Equipment Directory

1.2 GENERAL REQUIREMENTS

Except as modified in this Section or on the drawings, fire pumps shall be installed in conformance with NFPA 20, ~~including all recommendations and advisory portions, which shall be considered mandatory~~ except that the fire pumps does not have to be listed. All reference to the authority having jurisdiction shall be interpreted to mean the Contracting Officer.

1.3 SEQUENCE OF OPERATION

1.3.1 Primary Fire Pump

Fire pumps shall automatically operate when the pressure drops below 138 kPa . The fire pump shall be manually stopped and reset back to the automatic mode.

1.3.2 Safety Requirements

Coupling, rotating parts, gears, projecting equipment, etc. shall be fully enclosed or properly guarded so as to prevent possible injury to persons that come in close proximity of the equipment. The Contractor shall conduct testing of the fire pumps in a safe manner and ensure that all equipment is safely secured. Hoses and nozzles used to conduct flow tests shall be in excellent condition and shall be safely anchored and secured to prevent any misdirection of the hose streams.

1.4 COORDINATION OF TRADES

Tank supports, piping offsets, fittings, and any other accessories required shall be furnished as specified to provide a complete installation and to eliminate interference with other construction.

1.5 DELIVERY AND STORAGE

All equipment delivered and placed in storage shall be housed with protection from the weather, excessive humidity and temperature variations, dirt and dust, or other contaminants. Additionally, all pipes shall be either capped or plugged until installed.

1.6 FIELD MEASUREMENTS

After becoming familiar with all details of the work, the Contractor shall verify all dimensions in the field, and shall advise the Contracting Officer of any discrepancy before performing the work.

1.7 SUBMITTALS

Indicate submittal classification in the blank space following the name of the item requiring the submittal by using "G" when the submittal requires Government approval. Submittals not classified as "G" will show on the submittal register as "Information Only". For submittals requiring Government approval, a code of up to three characters should be used following the "G" designation to indicate the approving authority; codes of "RE" for Resident Engineer approval, "ED" for Engineering approval, and "AE" for Architect-Engineer approval are recommended. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Installation Requirements; G (ED)

Three copies of the Fire Pump Installation Drawings consisting of a detailed plan view, detailed elevations and sections of the pump room, equipment and piping, drawn to a scale of not less than 1:20 . Drawings shall indicate equipment, piping, and associated pump equipment to scale. All clearance, such as those between piping and equipment; between equipment and walls, ceiling and floors; and for electrical working distance clearance around all electrical equipment shall be indicated. Drawings shall include a legend identifying all symbols, nomenclatures, and abbreviations. Drawings shall indicate a complete piping and equipment layout including elevations and/or section views of the following:

- a. Fire pumps, controllers, piping, valves, and associated equipment.
- b. Sensing line for each pump including the pressure maintenance pump.
- e. Pipe supports and sway bracing.
- f. Restraint of underground water main to the building including details of pipe clamps, tie rods, mechanical retainer glands, and thrust blocks.
- g. A one-line schematic diagram indicating layout and sizes of all piping, devices, valves and fittings.
- h. A complete point-to-point connection drawing of the pump power, control and alarm systems, as well as interior wiring schematics of each controller.

As-Built Drawings;

As-built drawings, no later than 14 days after completion of the Final Tests. The Fire Pump Installation Drawings shall be updated to reflect as-built conditions after all related work is completed and shall be on reproducible full-size mylar film.

SD-03 Product Data

Fire Pump Installation Related Submittals;

A list of the Fire Pump Installation Related Submittals, no later than 7 days after the approval of the Fire Protection Specialist and the Manufacturer's Representative.

Installation Requirements; G,

Manufacturer's catalog data included with the Fire Pump Installation Drawings for each separate piece of equipment proposed for use in the system. Catalog data shall indicate the name of the manufacturer of each item of equipment, with data annotated to indicate model to be provided. In addition, a complete equipment list that includes equipment description, model number and quantity shall be provided. Catalog data for material and equipment shall include, but not be limited to, the following:

- a. Fire pumps, drivers and controllers including manufacturer's certified shop test characteristic curve for each pump. Shop test curve may be submitted after approval of catalog data but shall be submitted prior to the final tests.
- b. Pressure maintenance pump and controller.
- c. Piping components.
- d. Valves, including gate, check, globe valves.
- e. Gauges.
- f. Flow meter.
- g. Associated devices and equipment.

Spare Parts;

Spare parts data for each different item of material and equipment specified. The data shall include a complete list of parts and supplies, with current unit prices and source of supply, and a list of parts recommended by the manufacturer to be replaced after 1 year and 3 years of service. A list of special tools and test equipment required for maintenance and testing of the products supplied by the Contractor shall be included.

Preliminary Test;

Proposed procedures for Preliminary Tests, at least 14 days prior to the proposed start of the tests.

Proposed date and time to begin Preliminary Tests, submitted with the Preliminary Tests Procedures.

System Diagrams; G, (RE)

Proposed diagrams, at least 2 weeks prior to start of related testing. System diagrams that show the layout of equipment, piping, and storage units, and typed condensed sequence of

operation, wiring and control diagrams, and operation manuals explaining preventative maintenance procedures, methods of checking the system for normal, safe operation, and procedures for safely starting and stopping the system shall be framed under glass or laminated plastic. After approval, these items shall be posted where directed.

Fire Protection Specialist; G, (RE)

The name and documentation of certification of the proposed Fire Protection Specialists, no later than 14 days after the Notice to Proceed and prior to the submittal of the fire pump installation drawings.

Manufacturer's Representative; ~~G~~

The name and documentation of certification of the proposed Manufacturer's Representative, concurrent with submittal of the Fire Protection Specialist Qualifications.

Field Training; ~~G~~

Proposed schedule for field training submitted at least 14 days prior to the start of related training.

Final Acceptance Test;

Proposed date and time to begin Final Acceptance Test, submitted with the Final Acceptance Test Procedures. Notification shall be provided at least 14 days prior to the proposed start of the test. Notification shall include a copy of the Contractor's Material & Test Certificates.

Proposed procedures for Final Acceptance Test, no later than 14 days prior to the proposed start of the tests.

SD-06 Test Reports

Preliminary Test;

Three copies of the completed Preliminary Tests Reports, no later than 7 days after the completion of the Preliminary Tests. The Preliminary Tests Report shall include both the Contractor's Material and Test Certificate for Underground Piping and the Contractor's Material and Test Certificate for Aboveground Piping. All items in the Preliminary Tests Report shall be signed by the Fire Protection Specialist and the Manufacturer's Representative.

Final Acceptance Test;

Three copies of the completed Final Acceptance Tests Reports, no later than 7 days after the completion of the Final Acceptance Tests. All items in the Final Acceptance Report shall be signed by the Fire Protection Specialist and the Manufacturer's Representative. Test reports in booklet form (each copy furnished in a properly labeled three ring binder) showing all field tests and measurements taken during the preliminary and final testing, and documentation that proves compliance with the specified performance criteria, upon completion of the installation and

final testing of the installed system. Each test report shall indicate the final position of the controls and pressure switches. The test reports shall include the description of the hydrostatic test conducted on the piping and flushing of the suction and discharge piping. A copy of the manufacturer's certified pump curve for each fire pump shall be included in the report.

SD-07 Certificates

Fire Protection Specialist; G7

Concurrent with the Final Acceptance Test Report, certification by the Fire Protection Specialist that the fire pump installation is in accordance with the contract requirements, including signed approval of the Preliminary and Final Acceptance Test Reports.

SD-10 Operation and Maintenance Data

Fire Pumps;

Six manuals listing step-by-step procedures required for system startup, operation, shutdown, and routine maintenance, at least 14 days prior to field training. The manuals shall include the manufacturer's name, model number, parts list, list of parts and tools that should be kept in stock by the owner for routine maintenance including the name of a local supplier, simplified wiring and controls diagrams, troubleshooting guide, and recommended service organization (including address and telephone number) for each item of equipment.

1.8 FIRE PROTECTION SPECIALIST

Work specified in this section shall be performed under the supervision of and certified by the Fire Protection Specialist. The Fire Protection Specialist shall be an individual who is a registered professional engineer and a Full Member of the Society of Fire Protection Engineers or who is certified as a Level IV Technician by National Institute for Certification in Engineering Technologies (NICET). The Fire Protection Specialist shall be regularly engaged in the design and installation of the type and complexity of system specified in the Contract documents, and shall have served in a similar capacity for at least three systems that have performed in the manner intended for a period of not less than 6 months.

1.9 REGULATORY REQUIREMENTS

Compliance with referenced NFPA standards is mandatory. This includes advisory provisions listed in the appendices of such standards, as though the word "shall" had been substituted for the word "should" wherever it appears. In the event of a conflict between specific provisions of this specification and applicable NFPA standards, this specification shall govern. Reference to "authority having jurisdiction" shall be interpreted to mean the Contracting Officer.

PART 2 PRODUCTS

2.1 STANDARD PRODUCTS

Materials and equipment shall be standard products of a manufacturer regularly engaged in the manufacture of such products and shall essentially

duplicate items that have been in satisfactory use for at least 2 years prior to bid opening.

2.2 NAMEPLATES

All equipment shall have a nameplate that identifies the manufacturer's name, address, type or style, model or serial number, and catalog number. Pumps and motors shall have standard nameplates securely affixed in a conspicuous place and easy to read. ~~Fire pump shall have nameplates and markings in accordance with UL 448.~~ Electric motor nameplates shall provide the minimum information required by NFPA 70, Section 430-7.

~~2.3 REQUIREMENTS FOR FIRE PROTECTION SERVICE~~

~~Materials and Equipment shall have been tested by Underwriters Laboratories, Inc. and listed in UL Fire Prot Dir or approved by Factory Mutual and listed in FM P7825a and FM P7825b. Where the terms "listed" or "approved" appear in this specification, such shall mean listed in UL Fire Prot Dir or FM P7825a and FM P7825b.~~

2.3 UNDERGROUND PIPING COMPONENTS

2.3.1 Pipe and Fittings

Underground piping and piping under the building slab shall be ductile iron with a rated working pressure of 1034 kPa conforming to AWWA C151, with cement mortar lining conforming to AWWA C104. Piping more than 1500 mm (outside the building walls shall comply with Section 02510 WATER DISTRIBUTION SYSTEM.

2.3.2 Buried Utility Warning and Identification Tape

Detectable aluminum foil plastic-backed tape or detectable magnetic plastic tape manufactured specifically for warning and identification of buried piping shall be provided for all buried piping. Tape shall be detectable by an electronic detection instrument. Tape shall be color-coded for the utility involved and imprinted in bold black letters continuously and repeatedly over the entire tape length. Warning and identification shall be "CAUTION BURIED WATER PIPING BELOW" or similar wording. Code and lettering shall be permanent and unaffected by moisture and other substances contained in the trench backfill material. Tape shall be buried at a depth of 300 mm below the top surface of earth or the top surface of the subgrade under pavement.

2.4 ABOVEGROUND PIPING COMPONENTS

2.4.1 Pipe Sizes 65 mm and Larger

2.4.1.1 Pipe

Piping shall be ASTM A 795, Weight Class STD (Standard), Schedule 40 (except for Schedule 30 for pipe sizes 200 mm and greater in diameter), Type E or Type S, Grade A; black steel pipe. Steel pipe shall be joined by means of flanges welded to the pipe or mechanical grooved joints only. Piping shall not be jointed by welding or weld fittings. Suction piping shall be galvanized on the inside per NFPA 20.

2.4.1.2 Grooved Mechanical Joints and Fittings

Joints and fittings shall be designed for not less than 1200 kPa service and shall be the product of the same manufacturer. Fitting and coupling houses shall be malleable iron conforming to ASTM A 47/A 47M, Grade 32510; ductile iron conforming to ASTM A 536, Grade 65-45-12. Gasket shall be the flush type that fills the entire cavity between the fitting and the pipe. Nuts and bolts shall be heat-treated steel conforming to ASTM A 183 and shall be cadmium plated or zinc electroplated.

2.4.1.3 Flanges

Flanges shall be ASME B16.5, Class 150 flanges. Flanges shall be provided at valves, connections to equipment, and where indicated.

2.4.1.4 Gaskets

Gaskets shall be AWWA C111, cloth inserted red rubber gaskets.

2.4.1.5 Bolts

Bolts shall be ASTM A 193/A 193M, Grade B8. Bolts shall extend no less than three full threads beyond the nut with bolts tightened to the required torque.

2.4.1.6 Nuts

Nuts shall be ASTM A 194/A 194M, Grade 8.

2.4.1.7 Washers

Washers shall meet the requirements of ASTM F 436M . Flat circular washers shall be provide under all bolt heads and nuts.

2.4.2 Piping Sizes 50 mm and Smaller

2.4.2.1 Steel Pipe

Steel piping shall be ASTM A 795, Weight Class STD (Standard), Schedule 40, Type E or Type S, Grade A, zinc-coated steel pipe with threaded end connections. Fittings shall be ASME B16.39, Class 150, zinc-coated threaded fittings. Unions shall be ASME B16.39, Class 150, zinc-coated unions.

2.4.2.2 Copper Tubing

Copper tubing shall be ASTM B 88M , Type L or K, soft annealed. Fittings shall be ASME B16.26, flared joint fittings. Pipe nipples shall be ASTM B 42 copper pipe with threaded end connections.

2.4.3 Pipe Hangers and Supports

Pipe hangers and support ~~shall be UL listed UL Fire Prot Dir or FM approved FM P7825a and FM P7825b and~~ shall be the adjustable type. Finish of rods, nuts, washers, hangers, and supports shall be zinc-plated after fabrication.

2.4.4 Valves

~~Valves shall be UL listed UL Fire Prot Dir or FM approved FM P7825a and FM P7825b for fire protection service.~~ Valves shall have flange or threaded end connections.

2.4.4.1 Gate Valves and Control Valves

Gate valves and control valves shall be outside screw and yoke (O.S.&Y.) type which open by counterclockwise rotation. Butterfly-type control valves are not permitted.

2.4.4.2 Tamper Switch

The suction control valves and the discharge control valves, shall be equipped with valve tamper switches for monitoring by the fire alarm system.

2.4.4.3 Check Valve

Check valve shall be clear open, swing type check valve with flange or threaded inspection plate.

2.5 FIRE PUMP

Fire pump shall be electric motor driven. Each pump capacity shall be rated at 31.5 liters per second with a rated net pressure of 138 kPa. ~~Fire pump shall furnish not less than 150 percent of rated flow capacity at not less than 65 percent of rated net pressure. Pump shall be centrifugal-vertical turbine in-line fire pump. The maximum rated pump speed shall be 2100 rpm when driving the pump at rated capacity. Pump shall conform to the requirements of UL 448.~~ Fire pump discharge and suction gauges shall be oil-filled type.

2.6 ELECTRIC MOTOR DRIVER

Motor shall conform to NEMA MG 1 and be marked as complying with NEMA Design B standards. Motor wattage shall be of sufficient size so that the nameplate wattage rating will not be exceeded throughout the entire published pump characteristic curve. The motor and fire pump controller shall be fully compatible.

2.7 FIRE PUMP CONTROLLER

Controller shall be the automatic type ~~and UL listed UL Fire Prot Dir or FM approved FM P7825a and FM P7825b suitable~~ for fire pump service. Pump shall be arranged for automatic start and manual push-button stop. Manual stopping shall be accomplished only after all starting causes have returned to normal and after a minimum pump run time has elapsed. Controllers shall be completely terminally wired, ready for field connections, and mounted in a NEMA Type 2 drip-proof enclosure arranged so that controller current carrying parts will not be less than 300 mm above the floor. Controller shall be provided with voltage surge arresters installed per NFPA 20. Controller shall be equipped with a bourdon tube pressure switch or a solid state pressure switch with independent high and low adjustments, automatic starting relay actuated from normally closed contacts, visual alarm lamps and supervisory power light. Controller shall be equipped with a thermostat switch with adjustable setting to monitor the pump room temperature and to provide an alarm when temperatures falls below 5 degrees C. Controller shall be equipped with a sequential start timer/relay feature to start multiple fire pumps in sequence. The controller shall be factory-equipped with a heater operated by thermostat to prevent moisture in the cabinet.

2.7.1 Controller for Electric Motor Driven Fire Pump

Controller shall be electronic soft starting type. Controller shall be designed for 7.5 kW (10 HP) at single phase 240 volts. Controller shall monitor pump running, loss of a power, and pump room temperature. Alarms shall be individually displayed in front of panel by lighting of visual lamps. Each lamp shall be labeled with rigid etched plastic labels. Controller shall be equipped with terminals for remote monitoring of pump running, pump power supply trouble (loss of power), and pump room trouble (pump room temperature, and for remote start. Controller shall be equipped with a 7-day electric pressure recorder with 24-hour spring wound back-up. The pressure recorder shall provide a readout of the system pressure from 0 to 207 Pa (0 to 15 hp), time, and date. The controller shall be equipped with an externally operable isolating switch which manually operates the motor circuit. Means shall be provided in the controller for measuring current for all motor circuit conductors.

2.8 PRESSURE SENSING LINE

A completely separate pressure sensing line shall be provided for each fire pump. The sensing line shall be arranged in accordance with Figure A-7-5.2.1. of NFPA 20. The sensing line shall be 15 mm (H58 brass tubing complying with ASTM B 135M. The sensing line shall be equipped with two restrictive orifice unions each. Restricted orifice unions shall be ground-face unions with brass restricted diaphragms drilled for a 2.4 mm . Restricted orifice unions shall be mounted in the horizontal position, not less than 1.5 m apart on the sensing line. Two test connections shall be provided for each sensing line. Test connections shall consist of two brass 15 mm globe valves and 8 mm gauge connection tee arranged per NFPA 20.

One of the test connections shall be equipped with a 0 to ~~1380~~1208 kPa water oil-filled gauge. Sensing line shall be connected to the pump discharge piping between the discharge piping control valve and the check valve.

2.9 PUMP BASE PLATE AND PAD

A common base plate shall be provided for each vertical-shaft fire pump for mounting pump and driver unit. The base plate shall be constructed of cast iron with raised lip tapped for drainage or welded steel shapes with suitable drainage. Each base plate for the horizontal fire pumps shall be provided with a 25 mm galvanized steel drain line piped to the nearest floor drain. For vertical shaft pumps, pump head shall be provided with a cast-iron base plate and shall serve as the sole plate for mounting the discharge head assembly. Pump units and bases shall be mounted on a raised 100 mm reinforced concrete pad that is an integral part of the reinforced concrete floor.

2.10 PIPE SLEEVE

A pipe sleeve shall be provided at each location where piping passes through walls, ceilings, roofs, and floors, including pipe entering buildings from the exterior. Sleeves shall be grouted in position during construction. Sleeve shall be of sufficient length to pass through the entire thickness of the wall, ceilings, roofs and floors. The space between the exterior surface of the pipe and the interior surface of the sleeve shall be firmly packed with mineral wool insulation and caulk at both ends with plastic waterproof cement which will dry to a firm but pliable mass, or with a segmented elastomeric seal. Sleeves in masonry and concrete walls, ceiling, roofs and floors shall be hot-dip galvanized steel, ductile-iron, or cast-iron. Other sleeves shall be galvanized steel

sheet pipe not less than 4.4 kg per square meter .

2.11 ESCUTCHEON (WALL) PLATES

Escutcheon plates shall be one-piece or split-hinge type metal plates and shall be provided for piping passing through floors, walls, and ceiling in exposed areas. In finished areas, plates shall be polished stainless steel or chromium-plated finish on copper alloy. In unfinished areas, plates shall have painted finish. Plates shall be secured in position.

2.12 DISINFECTING MATERIALS

2.12.1 Liquid Chlorine

Liquid chlorine shall conform to AWWA B301.

2.12.2 Hypochlorites

Calcium hypochlorite and sodium hypochlorite shall conform to AWWA B300.

PART 3 EXECUTION

3.1 FIRE PUMP INSTALLATION RELATED SUBMITTALS

The Fire Protection Specialist shall prepare a list of the submittals from the Contract Submittal Register that relate to the successful installation the fire pump(s). The submittals identified on this list shall be accompanied by a letter of approval signed and dated by the Fire Protection Specialist when submitted to the Government.

3.2 INSPECTION BY FIRE PROTECTION SPECIALIST

The Fire Protection Specialist shall inspect the fire pump installation periodically assure that the installation conforms to the contract requirements. The Fire Protection Specialist shall perform a thorough inspection of the fire pump installation, including visual observation of the pump while running shall be conducted. There shall be no excessive vibration, leaks (oil or water), unusual noises, overheating, or other potential problems. Inspection shall include piping and equipment clearance, access, supports, and guards. Any discrepancy shall be brought to the attention of the Contracting Officer in writing, no later than three working days after the discrepancy is discovered. The Fire Protection Specialist shall witness the preliminary and final acceptance tests and, after completion of the inspections and a successful final acceptance test, shall sign test results and certify in writing that the installation the fire pump installation is in accordance with the contract requirements.

3.3 INSTALLATION REQUIREMENTS

Installation, workmanship, fabrication, assembly, erection, examination, inspection and testing shall be in accordance NFPA 20, except as modified herein. In addition, the fire pump and engine shall be installed in accordance with the written instructions of the manufacturer.

3.4 PIPE AND FITTINGS

Piping shall be inspected, tested and approved before burying, covering, or concealing. Fittings shall be provided for changes in direction of piping and for all connections. Changes in piping sizes shall be made using

tapered reducing pipe fittings. Bushings shall not be used.

3.4.1 Cleaning of Piping

Interior and ends of piping shall be clean and free of any water or foreign material. Piping shall be kept clean during installation by means of plugs or other approved methods. When work is not in progress, open ends of the piping shall be securely closed so that no water or foreign matter will enter the pipes or fittings. Piping shall be inspected before placing in position.

3.4.2 Threaded Connections

Jointing compound for pipe threads shall be polytetrafluoroethylene (PTFE) pipe thread tape conforming to ASTM D 3308 and shall be applied to male threads only. Exposed ferrous pipe threads shall be provided with one coat of zinc molybdate primer applied to a minimum of dry film thickness of 0.025 mm .

3.4.3 Pipe Hangers and Supports

Additional hangers and supports shall be provided for concentrated loads in aboveground piping, such as for valves and risers.

3.4.3.1 Vertical Piping

Piping shall be supported at each floor, at not more than 3 meters intervals.

3.4.3.2 Horizontal Piping

Horizontal piping supports shall be spaced as follows:

MAXIMUM SPACING (METERS)

Nominal Pipe Size (mm)	25 and Under	32	40	50	65	80	90	100	125	150+
Copper Tube	1.8	2	2.4							
Steel Pipe	2	2.4	2.7	3	3.3	3.6	3.9	4.2	4.8	5.0

3.4.4 Underground Piping

Installation of underground piping and fittings shall conform to NFPA 24. Joints shall be anchored in accordance with NFPA 24. Concrete thrust block shall be provided at elbow where pipe turns up towards floor, and the pipe riser shall be restrained with steel rods from the elbow to the flange above the floor. After installation per NFPA 24, rods and nuts shall be thoroughly cleaned and coated with asphalt or other corrosion-retard material approved by the Contracting Officer. Minimum depth of cover shall be 900 mm .

3.5 ELECTRICAL WORK

Electric motor and controls shall be in accordance with NFPA 20 and NFPA 70, unless more stringent requirements are specified herein or are indicated on the drawings. Electrical wiring and associated equipment shall be provided in accordance with NFPA 20 and Section 16415 ELECTRICAL WORK, INTERIOR.

3.6 PIPE COLOR CODE MARKING

Color code marking of piping shall be as specified in Section 09900 PAINTING, GENERAL.

3.7 FLUSHING

The fire pump suction and discharge piping shall be flushed at 120 percent of rated capacity of each pump. Where the pump installation consists of more than one pump, the flushing shall be the total quantity of water flowing when all pumps are discharging at 120 percent of their rated capacities. The new pumps may be used to attain the required flushing volume. Flushing operations shall continue until water is clear, but not less than 10 minutes. The Contractor shall submit a signed and dated flushing certificate before requesting field testing.

3.8 FIELD TESTS

3.8.1 Hydrostatic Test

Piping shall be hydrostatically tested at ~~1551~~1207 kPa for a period of 2-hours, ~~or at least 345 kPa in excess of the maximum pressure, when the maximum pressure in the system is in excess of 1207 kPa.~~

3.8.2 Preliminary Test

The Fire Protection Specialist shall take all readings and measurements. The Manufacturer's Representative, a representative of the fire pump controller manufacturer, and a representative of the diesel engine manufacturer (when supplied) shall witness the complete operational testing of the fire pump and drivers. The fire pump controller manufacturer's representative and the diesel engine manufacturer's representative shall each be an experienced technician employed by the respective manufacturers and capable of demonstrating operation of all features of respective components including trouble alarms and operating features. Fire pumps, drivers and equipment shall be thoroughly inspected and tested to insure that the system is correct, complete, and ready for operation. Tests shall ensure that pumps are operating at rated capacity, pressure and speed. Tests shall include manual starting and running to ensure proper operation and to detect leakage or other abnormal conditions, flow testing, automatic start testing, testing of automatic settings, sequence of operation check, test of required accessories; test of pump alarms devices and supervisory signals, test of pump cooling, operational test of relief valves, and test of automatic power transfer, if provided. Pumps shall run without abnormal noise, vibration or heating. If any component or system was found to be defective, inoperative, or not in compliance with the contract requirements during the tests and inspection, the corrections shall be made and the entire preliminary test shall be repeated.

3.8.3 Final Acceptance Test

The Fire Protection Specialist shall take all readings and measurements. The Manufacturer's Representative, the fire pump controller manufacturer's representative, and the diesel engine manufacturer's representative (when

supplied) shall also witness for the final tests. The Contractor shall be responsible for repairing any damage caused by hose streams or other aspects of the test. The final acceptance test shall include the following:

3.8.3.1 Flow Tests

Flow tests using the fire hydrants shall be conducted. Flow readings shall be taken from each nozzle by means of a calibrated pitot tube with gauge or other approved measuring equipment. Rpm, suction pressure and discharge pressure reading shall be taken as part of each flow test. Voltage and ampere readings shall taken on each phase as part of each flow test for electric-motor driven pumps.

3.8.3.2 Starting Tests

Pumps shall be tested for automatic starting and sequential starting. Setting of the pressure switches shall be tested when pumps are operated by pressure drop. Tests may be performed by operating the test connection on the pressure sensing lines. As a minimum, each pump shall be started automatically 10 times and manually 10 times, in accordance with NFPA 20. The fire pumps shall be operated for a period of a least 10 minutes for each of the starts. Pressure settings that include automatic starting and stopping of the fire pump(s) shall be indicated on an etched plastic placard, attached to the corresponding pump controller.

3.8.3.3 Alarms

All pump alarms, both local and remote, shall be tested.

3.8.3.4 Miscellaneous

Valve tamper switches shall be tested.

3.8.4 Correction of Deficiencies

If equipment was found to be defective or non-compliant with contract requirements, the Contractor shall performed corrective actions and repeat the tests. Tests shall be conducted and repeated if necessary until the system has been demonstrated to comply with all contract requirements.

3.8.5 Test Equipment

The Contractor shall provide all equipment and instruments necessary to conduct a complete final test. The Contractor shall provide all necessary supports to safely secure hoses and nozzles during the test. The Government will furnish water for the tests.

3.8.6 Test Documentation

The Manufacturer's Representative shall supply a copy of the manufacturer's certified curve for each fire pump at the time of the test. The Fire Protection Specialist shall record all test results and plot curve of each pump performance during the test. Complete pump acceptance test data of each fire pump shall be recorded. The pump acceptance test data shall be on forms that give the detail pump information such as that which is indicated in Figure A-11-2.6.3(f) of NFPA 20. All test data records shall be submitted in a three ring binder.

3.9 DISINFECTION

After all system components are installed including pumps, piping, and other associated work, and all hydrostatic test(s) are successfully completed, thoroughly flush the pumps and all piping to be disinfected with potable water until there is no visible sign of dirt or other residue. and hydrostatic test are successfully completed, each portion of the piping specified in this Section system to be disinfected shall be thoroughly flushed with potable water until all entrained dirt and other foreign materials have been removed before introducing chlorinating material. The chlorinating material shall be hypochlorites or liquid chlorine. Water chlorination procedure shall be in accordance with AWWA M20. The chlorinating material shall be fed into the sprinkler piping at a constant rate of 50 parts per million (ppm). A properly adjusted hypochlorite solution injected into the system with a hypochlorinator, or liquid chlorine injected into the system through a solution-fed chlorinator and booster pump shall be used. Chlorination application shall continue until the entire system is filled. The water shall remain in the system for a minimum of 24 hours. Each valve in the system shall be opened and closed several times to ensure its proper disinfection. Following the 24-hour period, no less than 25 ppm chlorine residual shall remain in the system. The system shall then be flushed with clean water until the residual chlorine is reduced to less than one part per million. Samples of water in disinfected containers for bacterial examination will be taken from several system locations which are approved by the Contracting Officer. Samples shall be tested for total coliform organisms (coliform bacteria, fecal coliform, streptococcal, and other bacteria) in accordance with AWWA EWW. The testing method shall be either the multiple-tube fermentation technique or the membrane-filter technique. The disinfection shall be repeated until tests indicate the absence of coliform organisms (zero mean coliform density per 100 milliliters) in the samples for at least 2 full days. The system will not be accepted until satisfactory bacteriological results have been obtained.

3.10 FIELD TRAINING

The Fire Protection Specialist and the Manufacturer's Representative shall conduct a training course for operating and maintenance personnel as designated by the Contracting Officer. Training shall be provided for a period of 8 hours of normal working time and shall start after the fire pump installation is functionally complete but prior to the start tests specified herein. The field instruction shall cover all of the items contained in the approved Operating and Maintenance Instructions.

-- End of Section --

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