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RECORD OF REVISIONS

Rev	Date	Description	POC	OIC
0	6/28/99	Revised to become Chapter 3 of Facility Engineering Manual (FEM), superseding Civil Facilities Engineering Standards, Volume 3, Revision No. 8, 6/5/98.	Edward J. Hoth, *FWO-UI*	Dennis McLain *FWO-FE*
1	8/16/04	Chapter divided into four sections based on UniFormat98. FEM now ESM. Complete text revision.	Edward J. Hoth *FWO-UI*	Gurinder Grewal *FWO-DO*
2	10/27/06	Administrative changes only. Organization and contract reference updates from LANS transition. IMP and ISD number changes based on new Conduct of Engineering IMP 341. Master Spec number/title updates. Other administrative changes.	Edward J. Hoth *MSS-UI*	Kirk Christensen, *CENG*
3	05/27/15	Revised codes and standards, other minor technical and admin updates.	Jerome Gonzales, *ES-UI*	Lawrence Goen, *ES-DO*

CONTACT THE CIVIL ENGINEERING STANDARDS POC
for upkeep, interpretation, and variance issues

Ch. 3, G30	**Civil POC/Committee**

G30 SITE CIVIL/MECHANICAL UTILITIES

G30GEN GENERAL SITE CIVIL/MECHANICAL UTILITIES REQUIREMENTS

1.0 GENERAL

A. Scope: All utilities, including underground temporary utilities, shall comply with the requirements of this chapter.

B. UI Approval: Utility plans and submittals shall be reviewed (i.e., routing, material, sizing, tie-in, etc.) and approved by the LANL Utilities and Institutional Facilities (U&IF) Group system representative prior to construction.

C. Directional drilling: The depth of utilities installed by this means shall not substantially vary from the minimum required depths. Depths shall not be excessive where conventional excavation cannot be performed for routine operation and maintenance. Consult with a LANL U&IF representative prior to completion of system design.

D. Within the building: Refer to ESM Mechanical Chapter 6, especially Section D20, Plumbing/Piping/Vessels, for utility piping requirements.

E. Design: Consult with the mechanical designer for pipe sizing requirements, material selection, etc., when designing the site civil utilities.

F. Electrical Utilities: Refer to ESM Electrical Chapter 7 for additional requirements.

2.0 BOLLARDS

A. Provide bollards to protect fire hydrants, post indicator valves, natural gas valves, and regulator stations, etc. from vehicles. Do not use bollards near roadways where it is dangerous to vehicles traveling at high speed. Refer to the proper guide per AASHTO Roadside Design Guide. *Guidance: Bollards may be used to protect building garage door openings, indoor mechanical room equipment, etc. The bollard pipe size may be increased if necessary.*

B. Refer to LANL Civil Standard Detail ST-G30GEN-1 Bollard, for additional requirements.

3.0 CATHODIC PROTECTION

A. Provide cathodic protection for selected water storage tanks and for metallic piping in natural gas, steam, and condensate piping systems below grade, if required.

B. Contact the LANL U&IF Group system representative and Utilities Corrosion Specialist for requirements. Also refer to ESM Electrical Chapter 7, Section G4090.

4.0 PIPING TESTS

A. Test utility piping systems in accordance with LANL Master Specification 22 0813, *Testing Piping Systems*.

B. Comply with LANL Master Specification 01 3545, *Water Discharge Requirements*, for compliance with water discharge regulations to the environment and sanitary sewer.

C. Piping tests shall be witnessed by the LANL Subcontract Technical Representative (STR), LANL U&IF Group system representative and, for fire service mains, a LANL Fire Protection Group representative.

5.0 SEISMIC CONTROL

A. Refer to ESM Structural Chapter 5 and Mechanical Chapter 6, Section D10-30GEN, Seismic Control subsection, for requirements.

6.0 TIE-INS

A. Coordinate the location of the utility tie-in or service connection to the existing site distribution piping with a LANL U&IF Group system representative.

1. *Guidance: Refer to O&M Criterion 302, Utility Tie-Ins*

B. Excavation, backfill, and materials required for tie-ins to existing utility infrastructure (i.e., water, sewer, gas, storm water, steam/condensate, radioactive liquid waste [contact – TA-55 RLW Operations], industrial waste, manholes, lift stations, etc.) shall be provided by the Subcontractor or constructor. Tie-ins to existing utility infrastructure shall be performed by LANL.

C. Field tie-ins to existing utilities shall be inspected by the LANL STR or LANL MSS project coordinator and a LANL U&IF Group system representative.

D. Comply with the LANL tie-in details referenced in the specific utility subsection, e.g., water, gas, etc.

7.0 THRUST BLOCKS

A. Provide thrust blocks to restrain piping against movement; water service lines, sewer force mains, effluent force mains, etc.

B. Fire Service Mains: Comply with NFPA 24, Standard for the Installation of Private Fire Service and Their Appurtenances.

C. Refer to Civil Standard Detail ST-G30GEN-2, Thrust Blocks, for additional requirements.

8.0 TRACER WIRE AND IDENTIFICATION TAPE

A. Provide tracer wire in all non-metallic, cast iron, and ductile iron piping systems.

1. Refer to LANL Civil Standard Detail ST-G30GEN-3 for tracer wire and tracer wire test station details.

B. Provide 6-inch-wide, reinforced (non-metallic) color-coded identification tape 12 inches below finished grade and directly above buried pipe.[1] Color coding shall conform to American Public Works Association (APWA) Uniform Color Code.

C. For specifications and details of tracer wire, tracer wire test station, wire continuity testing, and identification tape refer to LANL Master Specification 31 2000, *Earth Moving*; and LANL Civil Standard Detail ST-G30GEN-4 Single Trench.

9.0 UTILITY LINE CLEARANCES, ABOVE GROUND

A. Structures shall not be sited in any utility right-of-way (ROW). If interferences exist, relocate structure or utility, or obtain written variance from LANL U&IF Group system representative and ESM Civil POC.

[1] Provides backhoe operator warning prior to reaching contact depth

B. For ROWs for overhead power lines refer to Electrical Chapter 7, Section G4010, Rights-of-Way subsection.

C. For other utilities, structures shall not be sited within 10 feet of an existing or new utility.

10.0 UTILITY LINE CLEARANCES, UNDERGROUND

A. Follow Table G30GEN-1 below for underground utility clearances.

B. When sewer and water lines have a vertical crossing, the sewer line shall not have a joint within 10 feet of the water line. Concrete encase the sewer line within 10 feet of a water line. Refer to G3020, Article 4.0 for additional requirements.

C. Refer to Civil Standard Detail ST-G30GEN-4 for piping trench and depth details.

D. Any above or below grade structures shall not be sited over or within 10 feet of an existing or new utility. Consult with the appropriate LANL U&IF Group system representative for design variations.

E. For secure communications lines, and for clearances to all other utilities contact and consult with LANL Security (PS-1) Group, Engineering and Security Services (NIE-ESS) and ESM Chapter 18 Secure Communications.

TABLE G30GEN-1

UNDERGROUND MINIMUM UTILITY LINE CLEARANCES [1]
Dimensions are in inches as measured between the outside surfaces of the lines at the closest point

	Water	Sanitary Sewer	Force Main	Storm Drain	Natural Gas	Steam or Hot Water[1]	Open Telecommunications	RLW Lines	Electrical (13.2 kV)
Vertical Crossings[1]									
Water (potable/fire protection)	12								
Sanitary Sewer	24[2]	12							
Force Main	24	12	12						
Storm Drain	12	12	12	12					
Natural Gas	24	24	24	24	24				
Steam or Hot Water[1]	24	24	24	24	24	24			
Open Telecommunications	12	12	12	12	24	24	12		
RLW Lines	24	24	24	24	24	24	24	24	
Electrical (13.2 kV, 4160 V)	24	24	24	24	24	24	12	24	12[3]
Parallel Lines[1]									
Water (potable/fire protection)	24	120	120	60	60	60	36	60	36
Sanitary Sewer (4" service)		24	36	24	60	60	36	60	36
Sewer Mains and/or > 8' Deep		60	60	60	60	60	60	60	60
Force Main			36	24	60	60	36	60	36
Storm Drain				24	60	60	36	60	36
Natural Gas					60	60	60	60	60
Steam or Hot Water[1]						60	60	60	60
Open Telecommunications							12[1]	60	24
RLW Lines								24	60
Electrical (13.2kV, 4160 V)									12[3]

Notes:

[1] Non-metallic piping shall have a minimum parallel clearance distance of 20 feet from steam or hot water lines; vertical crossings of steam or hot water lines with non-metallic piping are not permitted.

[2] Sewer below water line, if possible

[3] Alternatively, 3 inches if concrete encased

11.0 UTILITY TRENCHES

A. Bed piping with selected granular material to provide protection to the pipe. Bedding shall be installed around pipe both interior and exterior to building wall. Bottom of trench shall be graded to provide a smooth, flat bearing surface, free of ridges and valleys, to provide continuous support for the pipe.

B. Do not complete backfill for underground piping systems until the piping systems have been tested and approved.

C. Specify the width of trenches for pipe and conduit to be not greater than noted in standard piping trench detail to permit satisfactory jointing and thorough tamping of the bedding. Excavate trenches 6 inches below the pipe invert and backfill to the pipe bottom with bedding material.

D. After the pipe has been installed and all testing has been completed, backfill all around the pipe with 6 inches of sand and then with select backfill material, at optimum moisture content to the appropriate density in layers not exceeding 8 inches in loose depth. Refer to this Chapter, Section G1030 on compaction, for percentage of optimum density. Take care to ensure thorough compaction of the fill under and around the full length of pipe and the full depth of the trench.

E. On steeper slopes, approximately 2:1, when compaction is difficult, a flowable fill that will meet general structural requirements is acceptable; see LANL Master Specification 31 2323.33.

F. Refer to LANL Master Specification 31 2000, *Earth Moving*; and Civil Standard Detail ST-G30GEN-4, Trench Detail, for additional requirements.

G3010 POTABLE/FIRE PROTECTION WATER

1.0 GENERAL

A. This subsection presents the criteria, standards and regulations related to the design of water distribution systems (potable and fire protection) for general service. It does not cover the criteria necessary for design of major transmission lines, wells, pumping facilities, or reservoirs. Domestic water distribution systems that also serve fire protection requirements shall be designed to satisfy the calculated Fire Hydrant Demand (see below) and the peak domestic demand. Where no other requirements are applicable, the peak domestic demand shall be based on 2.5 times the calculated average daily demand plus any special demands, such as industrial or processes that cannot be reduced during a fire. The distribution system shall be capable of meeting this combined demand at a minimum residual pressure of 20 psi at ground elevation (or higher elevation if special conditions apply) for a period of not less than 2 hours.

B. *Guidance: Potable water at LANL is supplied by storage tanks (gravity-fed). These tanks are monitored by LANL U&IF Group and filled by County of Los Alamos. Distribution lines (mains) supply potable water to technical areas at LANL, where the water is used as both fire protection water and potable water. Service lines provide service from the distribution line directly to the user's potable water system.*

1. *Two technical areas (TA-35 and TA-55) have separate water supply systems consisting of dedicated fire pumps drawing water from dedicated fire protection water tanks. TA-53 has a combined fire and domestic water supply with fire pumps/tanks. TA-33, TA-36, TA-39, TA-40, and TA-54 have a dedicated non-potable fire protection water supply mains.*

C. Locate distribution lines in utility corridors whenever possible.

D. For site backflow preventer requirements, refer to the Mechanical Chapter, Section D20, Cross Connection Control subsection.

E. Consider applicable pressure boundaries in the design of systems. Provide pressure-reducing valves (PRV) in distribution mains and buildings as appropriate.

1. Provide calculations to support piping material and PRV selection.

F. Water Meters: For all facilities greater than 10,000 sf floor area with restrooms, provide water meters. Meters shall be electronic and connected to the building automation system for monitoring[2].

G. Provide a minimum of 4 feet of cover for freeze protection on water lines except irrigation systems with automatic drain valves.

H. Domestic water and fire sprinkler water systems supply lead-ins shall not be run under buildings; risers shall be inside building within 3 feet of the exterior building wall.

I. Disinfect potable water lines in accordance with LANL Master Specification 33 1300/ 22 0816, *Disinfection of Potable Water Piping*.

J. Comply with the New Mexico Drinking Water Regulations, Title 20, Chapter 7, Part 1.

K. Refer to this Section's G30GEN-General Subsection, for additional general requirements.

L. Refer to LANL Master Specification 33 1000, *Water Utilities*, for additional requirements.

2.0 FIRE WATER DESIGN

A. Fire hydrants are provided throughout LANL for structural and wildland fires. Coordinate with LANL Fire Protection Group for new or relocated fire hydrants.

1. Hydrants shall be provided so that hose runs from hydrants to all exterior portions of a protected building are under 300 feet. Hydrants should not be closer than 40 feet to a building. Dead-end runs utilized as a single supply to fire hydrants shall not exceed 300 feet.

2. Fire Hydrant Demand - Where reliance is placed on fire department response, either for protection of unsprinklered buildings or where the fire department will serve as redundant (backup) protection, the water supply available from hydrants shall be capable of providing the flow rates established in the Uniform Fire Code based on the most severe fire risk on site. These values may be reduced by a maximum of 50% when the facility is provided with automatic sprinkler protection throughout, in accordance with the applicable NFPA Standards.

[2] Utility costs can only be controlled if measured, and these are helpful for determining per capita usage and demand patterns. These meters are not expensive and rarely require calibration, so life-cycle cost is low.

B. Provide minimum 6-inch-diameter fire protection main. Listed and/or approved control valves shall be installed at maximum intervals of not more than 5,000 feet on long supply lines and at maximum intervals of not more than 1,200 feet on main distribution loops, feeders and all primary branches connected to these lines.

C. Do not meter fire lines (detector check valves are not required).

D. All sectional and sprinkler control valves utilized on fire protection distribution systems shall be a UL/FM listed indicating type. Where required, the valves shall be supervised with locks or tamper indicating supervisory devices. Shut-off valves for fire hydrants may be listed non-indicating valves with approved road box.

E. Provide one tap to the water main when a fire protection system is required. Tie the potable water service line into the fire line upstream of the post indicator valve (PIV or PIVA). Provide a shut-off valve and valve box in the potable water line.

1. *Guidance: Locate PIV approximately 40 feet from the structure*.

2. *Guidance*: *Provide potable water service connections a minimum of 10 feet upstream of any controlling valves for fire protection systems.*

F. All water distribution systems should be of the looped grid type providing two-way flow with sectional valving arranged to provide alternate water flow paths to any point in the system. Sectional control valves should be provided to limit the number of hydrants and individual sprinkler systems made inoperative during a single line break to a total of five.

G. Refer to Mechanical Chapter Section D20, Cross Connection Subsection, for requirements for reduced pressure backflow preventer on fire protection riser inside building.

H. Provide listed, dry-barrel-type fire hydrants with one 4-1/2 inch hose connection and two 2-1/2 inch hose connections. Position hydrants so that the 4-1/2 inch outlet is facing the closest road accessed by fire fighting apparatus or as approved by LANL Fire Protection Group.

1. Fire hydrant hose connections shall utilize National Standard Hose threads. Hose connection outlets shall be not more than 30 inches above or less than 18 inches below the final grade. When located in a hose house: 18 inches above the floor.

2. Maintain a 3-ft clear space around the circumference of fire hydrants. Where fire hydrant is subject to impact by a motor vehicle, bollards or other approved means shall be installed to protect the hydrant from impact.

I. The need for new water storage tanks or fire pumps shall be determined and coordinated by LANL Fire Protection Group.

J. The water supply for fire protection water shall have a minimum duration of 2 hours[3]. Refer to Policy PD 1220, LANL Fire Protection Program, for requirements when an independent source of fire protection water is required.

[3] Policy PD 1220, LANL Fire Protection Program

K. Fire protection valves, fire hydrant valves, and fire hydrants shall be color-coded and numbered per the Utilities Maintenance Instruction (*UI-PROC-74-30-010*), American Public Works Association recommendations, and ESM Chapter 1 Section 200.

3.0 ADDITIONAL REQUIREMENTS

A. Master Specification 33 1000, Water Utilities

B. NFPA 20, Standard for the Installation of Stationary Pumps for Fire Protection

C. NFPA 24, Private Fire Service Mains and Their Appurtenances

D. AWWA Standards and Standard Practice Manuals

E. DOE-STD-1066, Fire Protection Design Criteria

LANL Standard Details

F. Civil Detail ST-G30GEN-1, Bollard Detail and Locations at Fire Hydrant and PIV

G. Civil Detail ST-G30GEN-3, Tracer Wire

H. Civil Detail ST-G3010-1, Valve Box

I. Civil Detail ST-G3010-2, Water Piping Tie-In

J. Civil Detail ST-G3010-3, Water Piping Shut-off Valves

K. Civil Detail ST-G3010-4, Fire Hydrant/Shut-off Valves

L. Civil Detail ST-G3010-5, Sloping Pipe Anchors

M. Civil Detail ST-G3010-6, Valve Supports

N. Civil Detail ST-G30GEN-4, Single Trench Detail

O. Fire Protection Detail ST-D4010-1, Sprinkler System Riser

P. Mechanical Detail ST-D2020-1, Site/Building Water Component Diagram

G3020 SANITARY SEWER

1.0 GENERAL

A. This subsection presents the requirements, standards and regulations related to the design of sanitary sewerage systems for general service. It does not cover the requirements necessary for design of major interceptor sewers, or treatment facilities.

B. All site and building drains connected to the sanitary collection system shall have an approved Waste Profile Form (WPF) for discharge to the sanitary sewer for all anticipated wastewater. The WPF shall be submitted to the LANL STR or LANL MSS project coordinator and the U&IF Group wastewater representative prior to completion of system design. Refer to LANL Procedure P930-1 for Waste Acceptance Criteria.

C. To prevent construction debris from entering sanitary collection system, the new lines shall be plugged or not connected until new lines are video surveyed and structure is in commissioning phase.

D. When a sewer main is not available, consult with a LANL U&IF Group wastewater representative.

2.0 DESIGN

A. In areas with an office and industrial mix, roughly representative of the LANL as a whole, the population of the contributing area should be determined and the design flows calculated to be 25 gallons per capita per day, minimum. Special facilities may require more sophisticated sanitary sewer design flow/volume calculations. *Guidance: Refer to the New Mexico Environmental Department, Liquid Waste Disposal and Treatment (NMAC 20.7.3) Regulations for further guidance in the determination of population loadings and design flows.*

B. Design for pipe to flow a maximum of one-half full.

C. Use Manning's Formula for determination of pipe flow velocities and capacities. Use a Manning's "n" value of 0.013 in calculations performed to determine the following:

1. Peak velocity (velocity at peak flow conditions).
2. Average velocity (velocity at average flow conditions).
3. Minimum cleansing velocity (2 fps).

D. Depth of sewer lines must be below frost depth, top of pipe to be 48 inches deep minimum.

E. *Guidance: Refer to American Society of Civil Engineers Publications 77, Design and Construction of Urban Stormwater Management Systems; and 37, Design and Construction of Sanitary and Storm Sewers.*

3.0 MANHOLES

Comply with the following manhole criteria for sewer systems:

A. The distance between manholes for 6 to 21 inch sewers is 450 feet maximum in undeveloped areas and 300 feet maximum in urban areas.

B. Manholes are required for changes in horizontal sewer alignment.

C. Manholes are required for abrupt changes in vertical sewer alignment (drop manholes).

D. Manholes are required for 6 inch and larger service connections to sewer mains.

E. Manhole depths shall not be less than 6 feet, as measured from rim to invert, without prior approval of the LANL U&IF Group.

F. The manhole shall have a minimum inside diameter of 4 feet.

G. The manhole shall have a shelf, with a minimum width of 9 inches on each side of each main line within the manhole.

H. Where the primary flow changes direction within a manhole, the manhole must be of a sufficient size to accommodate a centerline radius of curvature of the flow invert larger than the pipe diameter.

I. Rim elevation shall be minimum 6 inches above final grade in undeveloped areas.

J. Manholes shall not be located in areas where surface infiltration is possible.

K. Do not exceed 90 degree changes in horizontal flow direction within manholes.

L. Note invert elevations for each inlet and outlet to a manhole on construction drawings.

M. Provide a slope across the manhole invert at least equal to the average of the slopes of the incoming and outgoing sewers, with a minimum drop of 0.10 feet. Design the inverts to produce a smooth water surface at design flow with no backwater conditions in any of the incoming sewers.

N. Drop piping on the inside of the manhole barrel is not permitted, without prior approval of the LANL U&IF Group.

O. Refer to LANL Standard Civil Detail ST-G3020-1, Sanitary Sewer Manhole; and LANL Master Specification 33 0513, *Manholes and Structures*, for additional requirements.

4.0 SEWER LINES/LIFT STATION

A. Minimum allowable sewer main size: 8-inch inside diameter (exception: appropriately size service laterals for the facility being served).

B. Use Table G3020-1 showing minimum slopes required for non-curvilinear sewers to ensure that minimum allowable velocities are maintained in these standards. GREATER SLOPES THAN MINIMUM ARE DESIRABLE AND ARE TO BE PROVIDED WHERE POSSIBLE. Slopes that may result in the development of super-critical flow conditions within the sewer are unacceptable.

C. Abrupt changes in grade and slopes opposite to the direction of flow are unacceptable. Slope of sanitary sewer lines shall be continuous and uniform without fittings and angled pipe joints.

D. Provide two-way cleanouts on sanitary sewer service lines within five feet of building.

E. Comply with the following for new sanitary sewers and service laterals criteria:

1. Do not route sewers or force mains within 10 feet of parallel potable waterlines or firelines. If not feasible, sewer lines shall be encased in secondary pipe, entire encasement shall be sealed and pressure tested to the same requirement as the sewer line. Encasement shall extend into the down stream manhole and be open for monitoring and drainage.

2. Where potable waterlines must cross sewers or force mains, waterlines shall pass 2 feet above the sewer or force main. Where insufficient cover precludes such vertical separation, provide pressure system pipe material for sewer or force main

and encase sewer line in concrete for a minimum distance of 10 feet to each side of the waterline crossing when sewer is above the water line.

3. The sewer pipe shall not have a joint within 10 feet of the water line when crossing lines are perpendicular.

4. Locate sewers such that they can be maintained without disturbance of existing or future facilities.

5. Sewer lines crossing under roads, parking lots, or structures, shall be ductile iron, unless variance is granted by the LANL U&IF Group wastewater system representative.

F. Provide a lift station only when gravity flow is not possible or feasible. Locate lift station inside of building when serving one building; see LANL Master Specification 22 1343.16, *Facility Wet-Well Packaged Sewage Pumping Stations (Interior).*

1. Refer to LANL Civil Standard Detail ST-G3020-2, Exterior Sewage Lift Station; and LANL Master Specification 33 3200, *Wastewater Utility Pumping Stations*, for additional site lift station requirements.

2. Lift station for service of a single building shall be a packaged unit and placed in the interior to the building being served. Installation shall be approved by the LANL U&IF Group wastewater system representative and Building Manager.

G. Refer to LANL Master Specification 33 3000, *Sanitary Sewerage Utilities*, for additional requirements and type of material for lines.

TABLE G3020-1

MINIMUM SEWER MAIN SLOPES	
SEWER I.D (inches)	MINIMUM SLOPE (ft/ft)
8	0.0060
10	0.0028
12	0.0022
15	0.0015
18	0.0012

5.0 CURVILINEAR SEWERS

A. Curvilinear sewers are not recommended and must be approved by the LANL U&IF Group wastewater system representative.

6.0 SERVICE LATERALS

A. Service laterals must be constructed to be maintainable for entire length from connection to building. Minimum service lateral pipe size shall be 4 inch.

B. Connect 4-inch service laterals directly to existing sewers with factory manufactured saddles or tees only or manholes. Four-inch service lateral connections greater than 100 feet in length may require new manholes.

C. Use a manhole to make 4-inch and 6-inch service lateral connections to 6 inch sewers and all service lateral connections 8 inches and larger. Service connections to a manhole shall be made with the invert of the new service lateral at 0.2 feet above the invert of the existing sewer.

D. Construct service connections without bends unless cleanouts are installed as approved by the LANL U&IF Group wastewater system representative.

E. Provide service laterals with a minimum slope of 1/4 inch per foot between the sewer and the facility being served. Provide a minimum depth of cover of 4 feet at the exit point from the structure. Ensure service drains inside buildings are not lower than the manhole rim of the sewer main into which they drain.

G3030 STORM WATER

1.0 DESIGN

A. Comply with the following LANL Standards for piping and appurtenances requirements.

1. Master Specification 33 4000, Storm Drainage Utilities
2. Civil Detail ST-G3030-1, Concrete Catch Basin
3. Civil Detail ST-G3030-2, Precast Concrete Catch Basin
4. Civil Detail ST-G3030-3, Storm Water Manhole.

B. *Guidance: Refer to American Society of Civil Engineers Publications 77, Design and Construction of Urban Stormwater Management Systems; and 37, Design and Construction of Sanitary and Storm Sewers.*

C. *Guidance: Reference LANL Site and Architectural Design Principles (pgs 83-88 of LA-UR 01-5383) and Sustainable Design Guide (pgs 147-153), on Architectural Chapter, for additional expectations on integration of landscaping and storm water management.*

D. *Guidance: Reference LANL ESM Chapter 3, Sections G10 and G20, and the LANL Storm Water BMP Manual LA-UR-11-10371 for additional information on both storm water management and EISA 438 storm water compliance requirements.*

G3040 STEAM/CONDENSATE

1.0 DESIGN

A. Steam Piping: All steam piping systems greater than 15 psig, upstream of the first steam shutoff valve (including systems and valves inside the building), shall comply with ASME B31.1, Power Piping. Steam piping systems less than 15 psig shall comply with ASME B31.9, Building Services Piping (or, if serving a process, B31.3 Process Piping).

B. For new buildings in TA-3 using the site steam distribution system, design for incoming temperature of 500 deg F and 150 psig. For the condensate return system design for 250 degrees F and 150 psig.

C. Cast iron is not permitted.[4]

D. Condensate Piping: Condensate piping outside of the building that returns to a central steam plant shall comply with ASME B31.1, Power Piping.

E. Refer to the following LANL Standards for additional requirements:

1. Master Specification 33 6300, Steam Energy Distribution
2. Civil Standard Detail ST-G3040-1, Site Steam/Condensate Tie-in
3. Civil Standard Detail ST-G3040-2, Site Steam Drip Leg
4. Mechanical Standard Details for building steam PRV station.

G3060 NATURAL GAS

1.0 DESIGN

A. Design natural gas service in accordance with 49 CFR 192, Transportation of Natural and Other Gas by Pipelines; Minimum Federal Safety Standards; and ASME B31.8, Gas Transmission and Distribution Piping Systems.

B. Design system piping capacity based on 60 psig gas pressure; use 100 psig maximum operating pressure for pressure containment design.

C. Meters: Provide a gas meter for any building with a heating unit with an input btu requirement of 5,000,000 btu/hr or greater[5]. The meter shall:

1. be installed downstream of the low pressure natural gas regulator

[4] Cast iron prohibited due to potential for catastrophic failure, e.g., May/June 2004 Otowi manhole valve

[5] Energy costs can only be controlled if measured. These meters are not expensive and rarely require calibration, so life-cycle cost is low. The 5 Mbtu/hr rating triggers an NMED air-quality monitoring requirement. Installing meters for smaller users would provide energy consumption data but would not otherwise be productive as there is no funding to maintain or read the meters, even if tied-in electronically. Utility revenue is based on the number of FTEs, not on natural gas consumption; natural gas revenues are calculated by CFO-WP (e.g., Olivia Li). As of 2004, 70% of the LANL natural gas demand was already metered at some level. Similar reasoning for steam meters, plus high meter maintenance costs. Based on e-mails, Jerome Gonzales, ES-UI, to Oruch, 1/13/04.

2. be electronic and connected to the building automation system for monitoring
3. incorporate pressure and temperature compensation

D. Comply with the following LANL Standards for additional requirements:

1. Master Specification 33 5100, Natural-Gas Distribution
2. Civil Detail ST-G3010-1, Valve Box
3. Civil Detail ST-G3060-1, Site Gas Piping Tie-in
4. Civil Detail ST-G3060-2, Gas Regulator Station.

G3090 INDUSTRIAL WASTE

1.0 GENERAL

A. Design for on-site treatment and disposal systems must be approved by LANL's Solid Waste Operations Group and the LANL U&IF Group prior to design.

B. Use a separate collection system for industrial hazards and toxic wastes to keep them separate from the sanitary waste water system. Do not use a septic tank system or other on site disposal system to dispose of industrial, hazardous, or toxic waste.

C. Collect industrial toxic, hazardous, and oily wastewater in a holding tank and haul or pipe to a chemical treatment plant for subsequent treatment and disposal.

D. *Guidance: Consider on-site wastewater treatment and disposal systems only when tying into the existing system is not feasible or proves to be unreasonably expensive*.

2.0 RADIOACTIVE LIQUID WASTE / PROCESS LIQUID WASTE

A. Refer to Mechanical Chapter 6, Section D20, Subsection D2090 -- Other Plumbing Systems, for requirements.