Chapter 4-2: Sitework

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4-2.01 General

4-2.01A Work Included

The work included under this section will normally be included in Division 02 *Sitework*. "Sitework" will include, but is not limited to, the following: removing portions of existing facilities; relocating materials and equipment; removing portions of existing roof coverings; abandoning portions of waste disposal systems; removing waste disposal systems; removing and disposing of asbestos; lead abatement; clearing and grubbing; rough grading; earth work for building pads; aggregate base; free draining and granular materials; termite control; cast-in-drilled-hole piles; asphalt concrete; parking area seal coating; painted pavement markings; jacking pipe casings; water supply systems; drilling water well test holes; water wells; rehabilitate existing wells; abandoning (destroying) wells; sanitary sewage disposal systems; sewage pump system enclosures; recreational vehicle (RV) sanitary stations; septic sewage disposal systems; wash water systems; and communication towers.

Other sitework items that are part of this Division but may be the responsibility of the Resident Engineer (District construction) are: irrigation system for landscaping; chain link fencing; vinyl clad chain link fencing; guard posts; parking bumpers; disabled parking and authorization signs; and landscaping.

The Resident Engineer (RE) often handles all of the sitework. An exception to this occurs when utilities, such as water or gas, are located in the street(s) adjacent to the property, and/or, if any demolition is required to the existing structure(s). Utility work, connections, underground, and demolition may then become the responsibility of the Structure Representative (SR).

Review any Standard Special Provisions (SSPs) from Section 99[1], *Building Construction*, Division 02, *Sitework*, that have been included in the project *Special Provisions,* since much of the information therein typically will not be repeated in the following sections of this chapter.

4-2.01B Tips and Suggestions to Prepare for Inspection of Sitework

1. Check the project plans to confirm that all of the existing conditions on the site are accurately depicted.
2. Verify the existing utilities are located as shown on the project plans. You may also utilize the assistance of the Caltrans Maintenance staff, who may be aware of utilities that exist but are not shown on the project plans.

[1] Caltrans internal use only

3. Make spot grade checks of the project site to confirm the existing conditions (existing elevations) are as shown on the project plans.
4. Determine if the existing fences shown on the project plans are offset or are on the property lines. If the property lines have not been staked, request right-of-way staking.
5. Check the location of any existing wells, water meters, septic systems, or leach fields.
6. Check existing trees, landscaping, and landscape irrigation to determine how these existing items may be utilized or incorporated in the final construction.
7. Be sure to take plenty of preconstruction photos. Include the existing conditions of the site such as the structures, pavement, trees, shrubs, and landscaping. These photos will become useful in the event any existing conditions are damaged and have to be repaired or replaced. If the project includes remodel or rehabilitation, take photos of the existing interior conditions. Short, narrated video clips of the site can also prove very useful.
8. If as-built project plans are available, use those for reference in checking the existing conditions. Any discrepancies between the existing conditions and the project plans should be brought to the attention of the RE and the Project Architect.
9. If available, Caltrans will try to obtain service for water and sewer from existing utilities. The project plans and special provisions should describe the work, following the requirements of the serving utility company, to connect to those utilities.
10. Coordination of the sitework with Caltrans personnel must be planned as required by the special provisions. Confirm and coordinate schedules so that the sitework and Caltrans personnel can work without conflict.
11. Confirm the locations for connection of utilities and services, to and from the buildings, are laid out and coordinated to support all other sitework.
12. Demolition of any part of an existing facility will be done under the administration and inspection of the SR.
13. Hazardous waste removal and disposal of items, such as asbestos and lead-based paint, may be included in the site and the building work. Review the special provisions to determine the hazardous waste removal and disposal requirements.
14. Rough grading for the building pad may be under the purview of the RE. If the building pad(s) are being constructed separately from the grading of the site, coordinate with the RE to be sure that the building pad is constructed at least 5 feet wider than the exterior of the building dimensions. This will be necessary to provide room for items such as setting batter boards, scaffolding, or materials. The elevation of the subgrade will normally be the elevation of the bottom of the

granular fill material specified to be placed under the slab; however, that subgrade elevation is the decision of the Contractor.

15. The excavation, forming, and pouring of the building footings, and the excavation, installation, and backfill of the underground utilities within the building, should be completed prior to the placing of the granular fill under the slab.
16. If the slab details do not require a vapor barrier under the slab, the termite control will be applied directly to the granular fill and just prior to the concrete pour. If the slab is going to be poured in multiple pours, the termite application should be applied to the area to be poured just prior to the placing of the concrete.
17. Water supply systems will require coordination between the serving utility company, the RE, and the SR. If the project includes fire protection lines that are fed off the water supply system, the State Fire Marshal will require inspection of the underground water supply system before backfilling. Contact the serving utility company to inform them that the project is commencing and to confirm that their service has been arranged.
18. Drilling and installation of test wells and water wells may be done as part of the building work. It will be necessary to coordinate with the water and wastewater engineer to verify any special requirements, and the inspection procedures they may want performed.
19. Sanitary sewage disposal systems that are connected to public sewers will be completed as part of the sitework. Septic tank and leach field systems will be required if public sewers are not available. In those cases, the septic tank and leach field will be done as part of the building work. Contact the wastewater engineer to verify any special inspection requirements they may have. Special care should be taken to verify that the drain rock used for the leach lines is completely protected on all sides of the trench and wrapped with filter fabric to prevent soil from clogging up the leach field.
20. A three-cell clarifier is normally required on sites that have mud rinse and wash racks. These are self-contained units. The piping and installation are shown on the project plans and within the authorized submittals.
21. Sand/oil water separators are also self-contained units and shall be installed in accordance with the project plans and the authorized submittals.
22. Some three-cell clarifiers and/or sand/oil separators may be equipped with sludge and oil sensors. These sensors require electricity and a control panel for the display.

4-2.02 Site Preparation

The RE will usually be responsible for general earthwork.

If there are connections to a serving utility company, agreements for utility services should have been worked out during project development. Be sure to notify the serving utility company before the start of the project to confirm.

Be sure the Contractor is aware to notify the Underground Service Alert (USA) or similar notification centers prior to excavating in the public right-of-way. USA will locate and mark all utilities in the public right-of-way. They will not mark the locations on State-owned or other private property. USA will issue a permit number to confirm the notification for utility location. In California, notifying and obtaining a permit number from USA is mandatory. USA must be notified at least 48 hours before work begins. The USA toll-free number for Southern California is 1-800-422-4133 or 811; for Northern California, 1-800-642-2444 or 811.

4-2.03 Relocating Materials and Equipment

Reserved

4-2.04 Sanitary Sewage Disposal System

If an existing sanitary sewage system is available, the facility's system will tie into that system. In cases where the project site is remote, a septic tank system with leach fields may be constructed to dispose of the sanitary waste. The design for the septic and leach field will be included in the project plans in the wastewater section. Additional information on sanitary sewage systems is included in Division 15, *Mechanical Work*.

4-2.04A Abandon Portions of Waste Disposal System

Reserved

4-2.04B Remove Waste Disposal System

Reserved

4-2.04C Sanitary Sewage Disposal System Details (Enclosure)

Many of these systems are difficult to design because of site conditions and/or other constraints. Do not deviate from the project plans unless approved by the wastewater engineer.

4-2.04C(1) Pipes and Fittings

To follow are considerations when installing pipes and fittings:

1. Install pipe with slope shown on the project plans.

2. Do not allow humps or bellies in lines that may trap air or solids.
3. Do not change pipe direction with flexible couplings.
4. Do not install 90-degree bends in the sewer pipe. Use two 45-degree bends with cleanout.
5. During backfill, an underground tracer tape is installed on polyvinyl chloride (PVC) pipe.

4-2.04C(2) Septic Tanks (Pre-Cast)

Septic tanks may be pre-cast or cast-in-place. To follow are considerations for pre-cast tanks:

1. Small tanks used at maintenance stations are typically pre-cast concrete.
2. Check grades to verify that the outlet is lower than inlet.
3. The exterior of tank and the manholes shall be coated with a bituminous coating.
4. Check contract documents for specifications on waterproof membrane for the interior of the tank and manholes.
5. Some tanks have removable manholes for access.

4-2.04C(3) Septic Tank (Cast-In-Place)

To follow are considerations for cast-in-place septic tanks:

1. Cast-in-place (CIP) septic tanks are typically used for large tanks of 6,000 gallons or more.
2. The tank inlet is thru a manhole to prevent blockage at the inlet.
3. CIP tanks are used at safety roadside rest areas.
4. All tanks have outlet filters to reduce the amount of suspended solids that go to the leach field.

4-2.04C(4) Septic Tank (Fiberglass)

Fiberglass is an alternative material for septic tanks, with the following considerations:

1. Fiberglass septic tanks are typically used unless pre-cast tanks are more cost-effective or there is high groundwater.
2. Fiberglass-reinforced plastic tanks are better suited for sewage service and last longer; they are the preferred tank material over concrete.
3. Septic tanks typically have two or more chambers to prevent scum layer from exiting the tank and clogging pipes.
4. Fiberglass tanks are less prone to corrosion.



Figure 4-2.1. Septic Tank Connection with Cleanout and Diversion Valve to Allow Switching Between Two Leach Fields

4-2.04C(5) Clean-Out-To-Grade (COTG)

A clean-out-to-grade is needed for access to a plugged sewer line and is usually installed every 100 feet or where there is a change in direction of the sewer line; see Figure 4-2.1, above.

1. A Fernco type flexible cap or similar can be used. Do not use a female cap with threads because sand or other particulate can get into the threads.

4-2.04C(6) Valve and Meter Boxes

Valve and meter boxes are installed to provide access to items such as valves and monitor wells.

- Concrete collars are needed around each box to protect them and prevent movement.

4-2.04C(7) Leach Field

When the project plans include a leach field, the soil type should be checked as soon as the trenches are excavated. If the material appears to be permeable, there should be no problem. If there is any question about the material, contact the wastewater engineer.

A leach line has perforated pipe, filter fabric, and leach rock. The perforated pipe is backfilled with leach rock, which is wrapped with filter fabric to separate the leach rock from the surrounding soil. See Figures 4-2.2 through 4-2.4 for illustrations.

Instead of leach lines, infiltration chambers may also be used for leach fields. Infiltration chambers consist of plastic absorption chambers that are backfilled with native backfill.

Leach lines and absorption chambers must be installed level in the ground regardless of terrain.

When leach lines are to be installed in terrain with a slope greater than about 15 percent, there are two potential problems for these leach lines to be aware of:

1. When the material has fair to poor permeability, pockets of highly permeable material may cause trouble because the effluent will follow the path of least resistance and may surface prematurely.
2. When there is a layer of permeable topsoil over a strata of poor material, the effluent tends to flow downhill on top of the layer of poor material and can surface and pond at the base of the slope or may flow out through a cut bank on the downhill side.

Report any questionable conditions to the wastewater engineer immediately. These conditions may cause trouble depending on many variables such as the loading of the system and the peak design load.

4-2.04C7(a) Leach Fields with Perforated Leach Lines

The following is a typical procedure to follow when constructing a leach field with perforated leach lines.

1. Excavate trenches during dry conditions.
2. Rake the sides of the excavation to remove smeared surface and loose material.
3. Install filter fabric to allow water to pass through and prevent soil from entering the leach field.

   Note: No filter fabric is needed when using infiltration chambers.
4. Lay leach line dead level.
5. Use observation wells to inspect the depth of effluent in lines to estimate the percentage of the leach field being used. A diversion valve may be used to divert flow to multiple leach fields; see Figure 4-2.1.
6. Install crossover piping to connect one leach line to another.

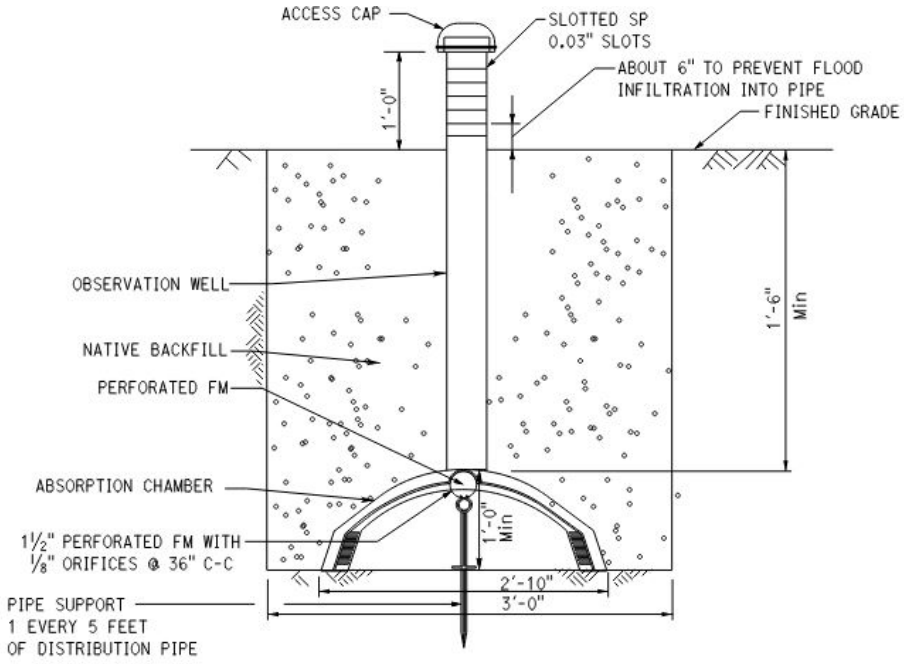


Figure 4-2.2. Leach Line Details



Figure 4-2.3. Perforated Leach Line and Leach Rock




Figure 4-2.4. Cover Rock Placed Over the Leach Line

4-2.04C7(b) Leach Fields with Infiltration Chambers

The following is a typical procedure to follow when constructing a leach field with infiltration chambers.

1. Excavate trenches during dry conditions.
2. Rake the sides of the excavation to remove smeared surface and loose material.
3. Lay the leach line chamber dead level.
4. Use observation wells to inspect the depth of effluent in lines and estimate the percent of leach field being used.
5. A distribution box may be used to divert flow to multiple chamber sections.

4-2.04C(8) Sewage Ponds

Sewage ponds are an alternate form of sewage treatment for large systems at safety roadside rest areas, as described in the following points:

1. The pond is usually sealed with a plastic liner.
2. Raw sewage flows directly to the pond.
3. There is typically no odor; however, the pond can turn over when the surface water is colder than the water at the bottom of the pond, resulting in some short-term odor. Floating aerators may be installed to prevent odors.
4. These ponds are called “Facultative Ponds” (the bottom area is anaerobic, meaning no oxygen; the top is aerobic, using oxygen to break down the particulate matter).

5. Algae combined with sunlight breaks down gases so that the following odorless gases are discharged to the atmosphere: N_2, H_2, and CH_4 (nitrogen, hydrogen, and methane).
6. Normally, a sewage lift station is used to pump to the pond.

See Figure 4-2.5 for an illustration of a completed sewage pond.



Figure 4-2.5. Completed Sewage Ponds

4-2.04C(9) Three-Cell Clarifier

A three-cell clarifier is used on wash racks, and its use is dependent upon the requirements for disposal of runoff; see illustration in Figure 4-2.6. Note that the outlet is taken from near the bottom of the clarifier. Solids and particulates settle to the bottom and oils float on top.

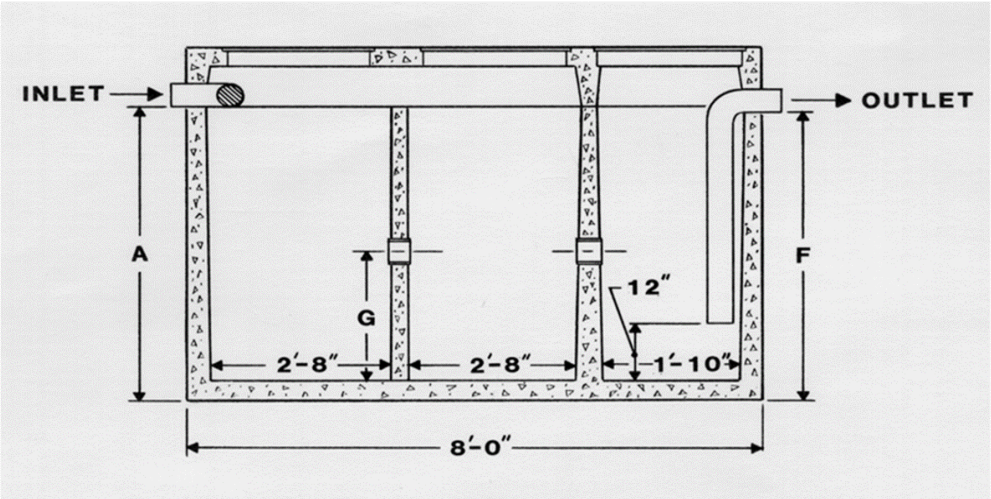


Figure 4-2.6. Typical Three-Cell Clarifier

4-2.04C(10) Sewage Pump Station Enclosure

Typically, there are two submersible pumps mounted on rails in a sump so they can be easily removed. The pumps are specified with cutter blades to allow pumping of fibrous material. There is an air bubbler system for liquid level that is connected to a pressure transducer. See Figure 4-2.7 for a schematic illustration of a sewage lift station.

Alternatively, float switches measure the liquid level in the sump.

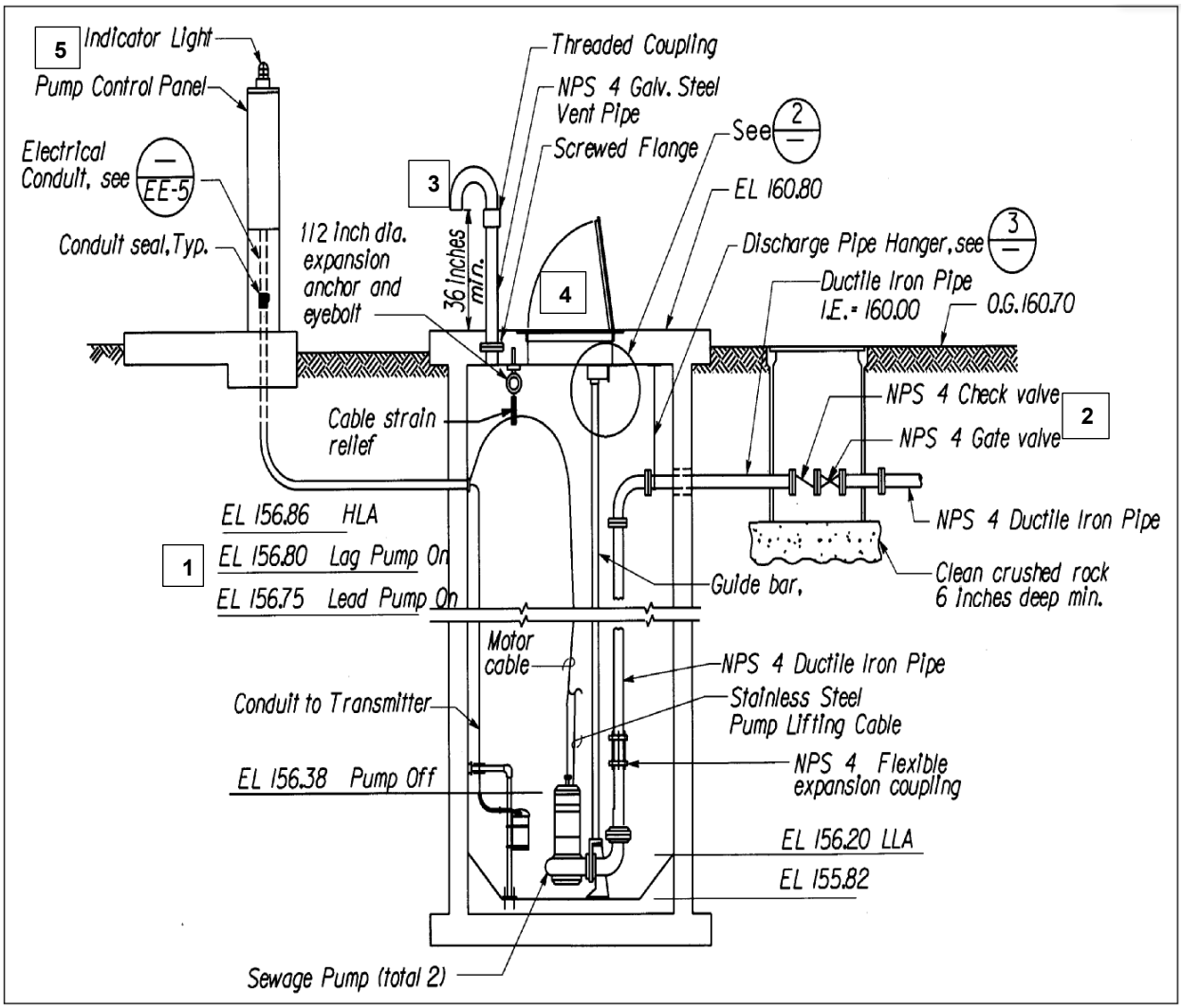


Figure 4-2.7. Sewage Lift Station* (Sewage Pipe Inlet not Shown)

*Notes on Figure 4-2.7:

1. Lead pump on – Lag pump on – high-level alarm – pump off
2. Check valve – gate valve
3. Vent – very smelly
4. Access opening
5. Pump control panel with conduit seal to prevent fire or explosions (methane gas)
6. Note: elevations are in metric unless noted otherwise

4-2.04C(11) Oil/Water - Sand/Oil Separator

A sand/oil separator is similar to a three-cell clarifier. It is used on wash racks, and its use is dependent upon the requirements for disposal of runoff. Note that the outlet is taken from near the bottom of the last chamber. Solids and particulates settle to the bottom and oils float to the top. Oil-absorbent pillows may be used to collect floating oil sheen. See Figure 4-2.8 for a schematic illustration.

This type of oil-water separator is rarely used on Caltrans projects. Instead of the coalescer, an oil-absorbing pillow in the first chamber will collect the small amount of oil typically encountered at Caltrans facilities.

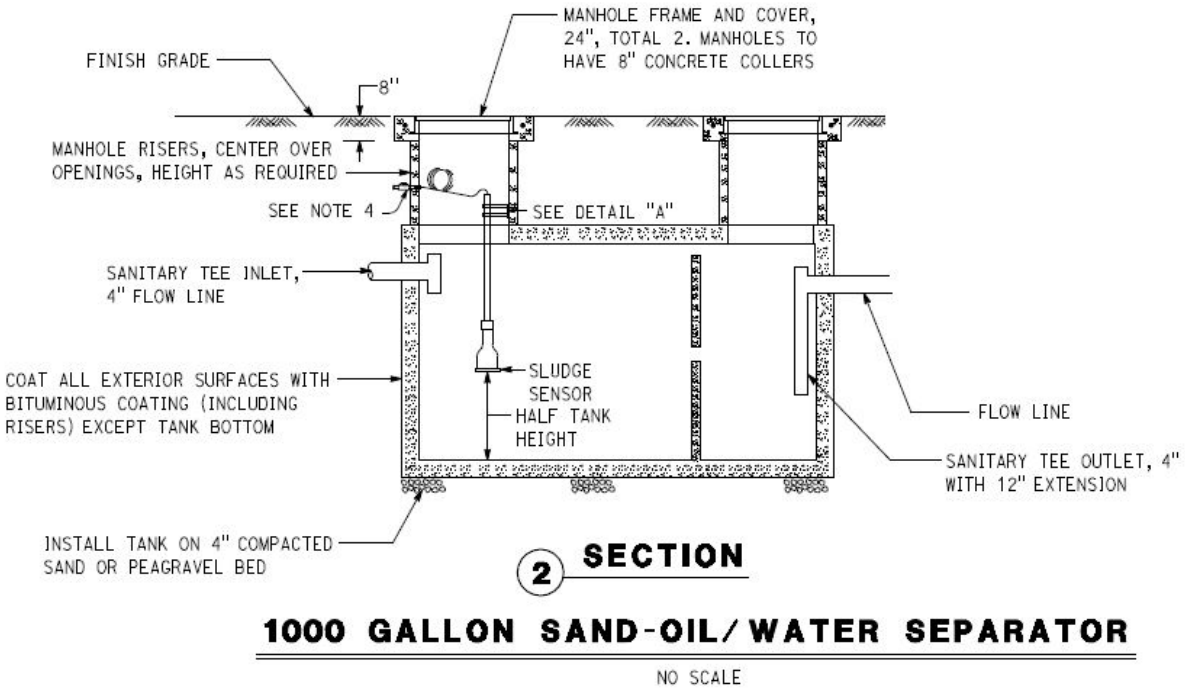


Figure 4-2.8. Sand/Oil Separator

4-2.05 Water Supply System

If there is an existing local water supply system, agreements for utility services should have been worked out during project development. These agreements will include the connection to, and purchasing of, water from that serving utility company. The water supply may provide water for domestic use, fire protection, wash rack and mud rinse, and landscape irrigation. If a local water supply system is not available, other systems may be utilized, such as well systems, pumps, or storage and pressure tanks.

Design of the water system, or the connection to the existing water system, will be included in the project plans within the water and wastewater sections. Additional information about the domestic water supply and fire protection is included in Division 15, *Mechanical Work*.

In the case where a serving utility company is capable of providing water, the District coordinates with that serving utility company and a Utilities Agreement is entered into between the two parties. This, on new jobs, is required prior to site approval.

Contact the serving utility company to inform them that the project is commencing and to confirm that their service has been arranged. Also verify that the service is consistent with the requirements in the project plans and the *Special Provisions*.

4-2.06 Site Electrical

Agreements concerning electrical service will have been completed during the project development. The Contractor will be responsible for protection of the existing utilities serving the property.

Existing facilities to be protected will be shown on the project plans. The serving electrical utility company will normally provide the transformer to meet the power requirements of the site. The transformer pad, trenching, conduit installation, and backfill from the point of connection to the transformer, and from the transformer to the service entrance section, are the responsibility of the Contractor and are included in the scope of work for the project. The serving electrical utility company will place the transformer on the transformer pad, finish and install the conductors from the point of connection to the transformer and from the transformer to the utility side of the service entrance section.

Caltrans has some sites where power is not available, and the entire site is served by an on-site generator system. Additional requirements for electrical will be shown on the project plans in the electrical section and are also further discussed in Division 16, *Electrical Work*.

Site lighting will be included in the electrical work. It may include items such as free-standing light standard bases and light poles, as well as any fixtures mounted on the exterior walls of the buildings to illuminate the site.

4-2.07 Natural Gas and Propane

If required, the project plans will include service from the serving utility company for natural gas, if available. The serving gas utility company will normally furnish and install the gas main from the point of connection to the meter location. They will also furnish

and set the gas meter. Trenching work may need to be performed by a utilities-certified operator for gas trench lines. If natural gas is not available and there is a need, a propane tank with a regulator and distribution system will be included in the scope of work. During project development, agreements with a local propane service company will be made to either provide and install the tank and regulators, or to furnish the propane and fill the tank.

In either case, the scope of the work for both gas and propane will be shown on the project plans within the mechanical section and the project *Special Provisions*. It is also further discussed in Division 15, *Mechanical Work*.

4-2.08 Telephone and Communication

Agreements with the serving telecommunication utility company will be worked out during project development. Similar to the manner of installing the electrical service, the serving telecommunication utility company will normally request the installation of a conduit from the point of connection to the punch down block where they will land their cable in the building. They will also require a backboard with 110-volt electrical receptacle on which they can mount their equipment to terminate their lines and connections of the distribution wiring throughout the site. The distribution wiring for the site will be provided under the contract and is usually not installed by the serving telecommunication utility company. The serving telecommunication utility company will provide and pull the cable from their point of connection into the building and land the cable on their punch down blocks and equipment on the backboard. Intercom and public address system for communication within the site will normally be carried in the wiring system installed from building to building.

If required, wireless communications are administered by the Division of Right of Way, including the placement of wireless infrastructure—such as antennas, shelters, and equipment—within freeway right-of-way, including at rest areas, maintenance stations, field offices, and Caltrans buildings. These installations are handled through encroachment permits, not through *Standard Specifications* Division XII, *Building Construction*.

The project plans and the *Special Provisions* will define the work to be provided to install the antenna, such as the shelters, and the location of the boxes and conduits for the equipment to be used for wireless communications.

4-2.09 Demolition

Demolition may be required for all or part of the existing facilities, which may include buildings, utilities, roofing, exterior siding, and fascia. Please refer to the demolition or removal plans included in the architectural sections of the project plans. The Project

Architect will usually provide a complete list of all the items to be demolished. It is frequently necessary to coordinate demolition carefully to be sure that all the required demolition has been listed. Notify your regional air quality regulator to determine reporting requirements for demolition that includes materials such as asbestos.

4-2.09A Removing Portions of Existing Facilities

Reserved

4-2.09B Removing Portions of Existing Roof Covering

Reserved

4-2.10 Removal and Disposal of Asbestos and Lead Abatement

Asbestos and lead are two common contaminants that hazardous materials removal workers encounter. In the past, asbestos was used in fireproofing, roofing, flooring, drywall mud and joints, adhesives for vinyl flooring, insulation for water lines, and a variety of other purposes.

Hazardous materials removal workers use a variety of tools and equipment depending on the work. The equipment required varies with the threat of contamination and can include disposable or reusable coveralls, gloves, hardhats, shoe covers, safety glasses or goggles, chemical-resistant clothing, face shields, and devices to protect one's hearing. Most workers are also required to wear respirators to protect them from airborne particles. The respirators range from those that cover only the mouth and nose to self-contained suits with supplied air.

Review the project *Special Provisions* to determine the extent of asbestos and lead abatement that is included in the contract. There are provisions within the contract for the Contractor to follow in the event that additional hazardous materials are discovered during construction and abatement is required.

4-2.11 Water Wells

The work involved for water wells can include work for both new wells and existing wells. Work for new water wells can include drilling, constructing, and testing. Work for existing water wells can include modifying, cleaning, test pumping, and disinfecting existing wells, removing and salvaging existing well pumps and controls, destroying existing wells, and installing and testing water supply systems. This work may also be addressed in Division 15, *Mechanical Work,* of the *Special Provisions*.

Figure 4-2.9 illustrates an existing water well serving five residents.



Figure 4-2.9. A Water Well Serving Five Residences in District 5

4-2.11A Drilling Water Well Test Hole

If the site has no serving utility company to provide water, an alternate source is developed, which is usually a well. This work consists of drilling a test hole, sampling selected formations, and obtaining geologic and hydrologic information regarding the depth, thickness, and the water-yielding potential, along with the water quality at the drilling site.

On new jobs, an analysis of the site for water is completed. The analysis can include the following:

1. Review water well drillers' reports for the area of the proposed site.
2. Review existing private wells in the area.
3. Review site for preferred well location.
4. Review geology of proposed site.
5. Drill test hole 400 to 1,000 feet deep and obtain:
    a. Aquifer gradation analysis
    b. Estimated quantity of water
    c. Estimated quality of water.

It is important to locate all existing wells and leach fields within the project limits and on adjacent properties. This is required because a well and leach field must be at least 100 feet apart. The locations are verified during project development; however, the conditions may have changed.

If required, the regulations, submittals, temporary shutdown, drill fluid, drill cutting samples, well log, geophysical log, development tests, water sampling down hole camera or borescope, and the testing well will be specified in the project *Special Provisions*.

The following items are the major water well components:

1. Bore
2. Conductor casing
3. Sanitary seal
4. Well casing
5. Well screen
6. Filter material (gravel pack)
7. Submersible well pump
8. Discharge piping
9. Water level sensor

One of the well tests is a sand content test. The test procedure shall be obtained from the Contractor for the specific tester being used to ensure proper testing is performed.

A water well is constructed by digging or drilling a hole deep enough to reach an aquifer and lining the well with a pipe to prevent collapse and allow water to flow up to the surface. A pump is then installed to extract the water from the well. See Figure 4-2.10 for an illustration of a well pump.



Figure 4-2.10. Well Pump (From AAARentals.com)

Along with constructing the water well, a hydro-pneumatic system must also be constructed. The hydro-pneumatic system is designed based on whether the well will produce sufficient water to meet the demand requirements of the proposed project or not. Alternatively, a booster pump system with variable frequency drive (VFD) can be

installed to provide water at a constant pressure. An air volume controller maintains the volume of air in the pressure tank so that it is never more than half full of water. Since air is compressible, this provides relatively constant system pressure; see Figure 4-2.11 for an illustration of a pressurized water tank.



Figure 4-2.11. Cache Creek Truck Inspection Facility - Pressurized Water Tank

In addition, a chlorine injection system is used to ensure proper disinfection of well water. In Figure 4-2.12, a “Cadillac” (high-quality, high-performance) of chlorine injection systems is shown. This system is known for its precision, reliability, and adaptability across a wide range of water-treatment applications.

Mounted on top of the tank are the pump and mixer. A predetermined concentration of chlorine is placed in the tank, and the dosing pump–featuring a wide adjustment range for accurate flow control–ensures proper disinfection without over-chlorination. The pump can be operated in two ways: either by activating it simultaneously with the booster pump or well pump, or by using an inline flow meter that signals the pump when to run and how much chlorine to inject.



Figure 4-2.12. A “Cadillac” of Chlorine Injection Systems

Before describing how this system integrates into a water distribution layout, the two types of water produced and distributed within the system are defined below:

1. Raw (Service) Water

   Supplies water closets, urinals, and the irrigation system.

2. Potable Water (Chlorinated Water)

   Supplies lavatories, hose bibs, drinking fountains, and sinks.

When water treatment beyond chlorination is required, a contact tank with a dual water distribution system (system piping and fittings) can be added to the overall installation. With proper control and monitoring equipment, along with air-volume control, the system can deliver both raw water and treated (potable) water as defined above.
If the well is unable to meet the facility's total demand, a storage tank and booster pump must also be included.

Example:

If the peak design demand is 150 gallons per minute (GPM) but the well can supply only 75 GPM, the well can still function effectively by continuously filling a storage tank. The stored water is then available during peak-demand periods. A booster pump provides the necessary flow rate and pressure to meet the full system demand.

The following are steps included when constructing a well:

1. Drill and sample pilot hole; see Figure 4-2.13.
2. Create a well log to record reference points of all measurements, including:
   a. Depth of each change of strata.
   b. Identification of material change.
   c. Depth of any substantial loss of drilling fluid.
3. A geophysical log shall consist of an electronic device that determines where water-bearing strata are by plotting the following three curves:
   a. Spontaneous potential curve.
   b. Point resistivity curve.
   c. 1.8-meter (6 foot) lateral resistivity curve.
4. Ream pilot hole for conductor casing and well seal to 50 feet minimum.
5. Place conductor casing.
6. Well seal is placed (neat cement and water).
7. Pilot hole is reamed to the well's final diameter; see Figure 4-2.13.

8. The blank casing and well screen are placed; see Figure 4-2.14.
9. The well screen is installed at the elevation(s) of the aquifers. See Figure 4-2.15 for an illustration of well screens.
10. The casing string “assembly” has centralizers to maintain an annular space between the casing and the borehole for the filter material.
11. Place filter material using a tremie pipe.
12. Weld on conductor casing cap, filter feed pipe, and casing vent.
    a. The filter feed pipe allows you to add filter material as it settles.
    b. The casing vent allows air to flow in and out as the water level changes in the well.
13. Check for plumbness and alignment.
14. Within 48 hours of installing the filter material, the well shall be fully developed.
15. Once the well is developed, it is tested at three different flow rates for three hours.
16. A sand test is performed.
17. Water sampling is done.
18. The well is disinfected.
19. TV survey is done - records depth as part of the recording.
20. Final 24-hour flow test is done.
21. Install pump and appurtenances; see Figure 4-2.16 for a schematic illustration.

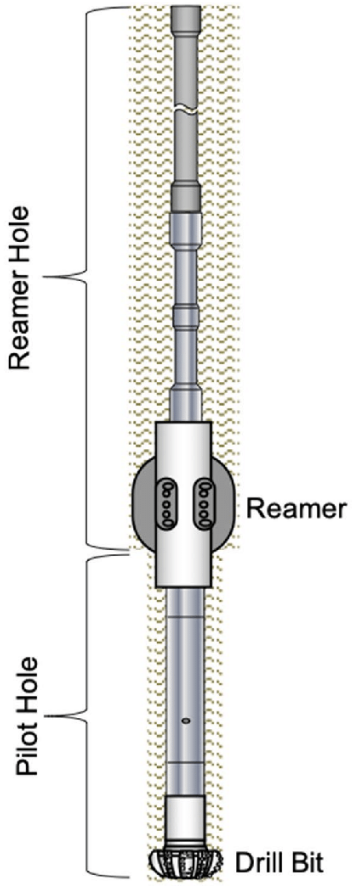


Figure 4-2.13. Drilling of Well Pilot Hole

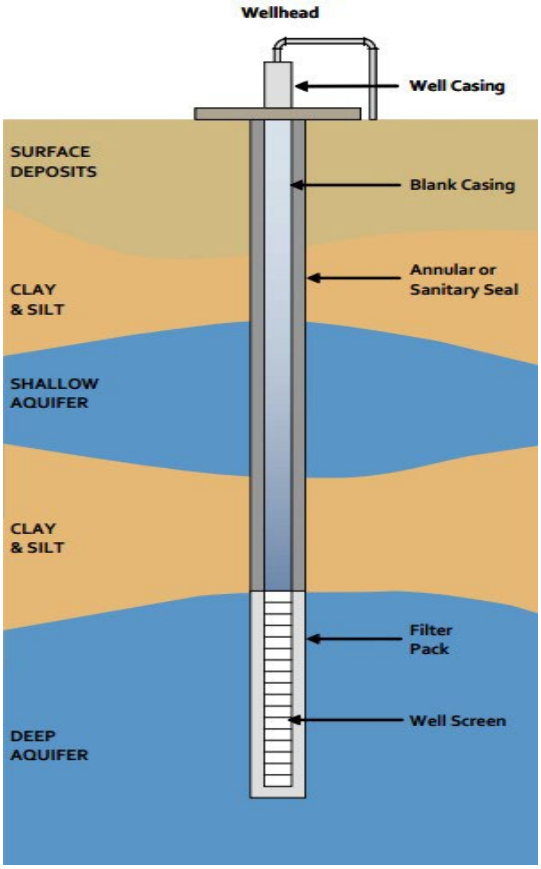


Figure 4-2.14. Well Casing with Well Screen

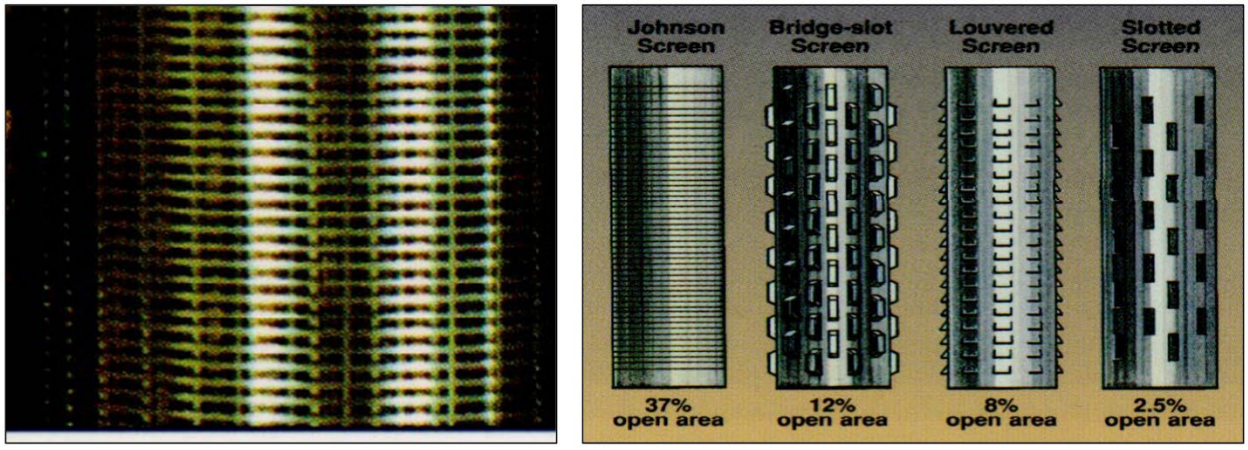


Figure 4-2.15. Typical Well Screens

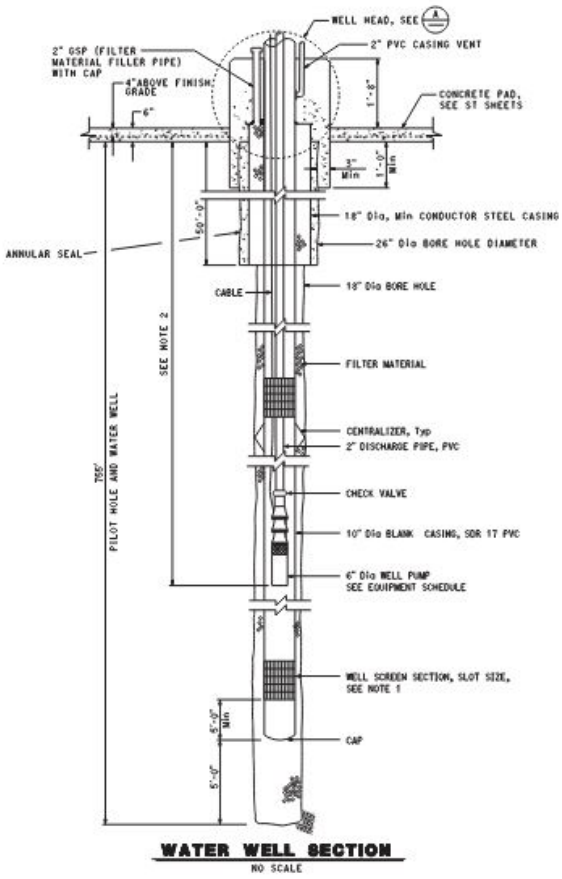


Figure 4-2.16. Completed Water Well Installed as Shown on Contract Plans

4-2.11B Rehabilitate Existing Well

Rehabilitating an existing well includes preliminary water sampling, sounding and cleaning, well redevelopment, development tests, final water sampling, disinfection, and television survey of the existing well prior to the installation of the permanent well pump.

4-2.11C Destroy Well

All existing appurtenances, including the well pump, motor, and discharge piping, shall be removed and properly disposed of. Excavate at least 5 feet of the well casing, cut the casing, and fill the well with lean concrete to the surface.

4-2.11D Regulations

Attention is directed to the provisions and destruction of wells as set forth in the current issue of the Department of Water Resources Bulletin No. 74, *Water Well Standards: State of California*.

4-2.11E Well Permit

The Contractor must make all arrangements to obtain the required well permit before job site well activities begin.

4-2.12 Clearing and Grubbing

The Resident Engineer may be responsible for the clearing and grubbing of the site. Prior to that work, review the specified existing conditions that are to remain, with the Contractor. Be sure that the Contractor properly flags and protects these items. The Project Architect should be contacted if there is difficulty in preserving the specified existing conditions. Be sure that the specified existing conditions to be preserved are included in the preconstruction photographs.

4-2.13 Grading

4-2.13A Rough Grading Earthwork for Building Pad

For the building pads, ensure that water drains away from the building(s). The grading of the site should provide for the containment of stormwater runoff within Caltrans property. The rough grade or subgrade for the building pads will normally be brought to the underside of the granular fill for the floor slabs. Compaction requirements for the building pads, parking lots, roadways, and backfill for utility trenches will be described in the project *Special Provisions*.

When the project plans show placement of the building foundation on a new fill, compaction of the material is essential to minimize differential settlement.

If the material appears unsatisfactory or is not what was expected, the problem should be discussed with the Project Architect and the structural designer. Local Geotechnical Services staff may also be consulted for their expertise.

4-2.13B Aggregate Base

Reserved

4-2.13C Termite Control

Termite control, if specified, must be installed in accordance with the authorized submittals. There is a specified rate of application for the termite control, expressed in gallons per hundred square feet. There will also be a recommendation for maximum time lapse between application of the termite treatment and the placing of concrete and/or covering it with a vapor barrier.

Read the special provisions to determine the areas to which termite treatment is to be applied. There may be a requirement for the placing of the termite treatment under the foundation systems if the foundations are poured separately (non-monolithically) from the slab. The special provisions will require that the horizontal and vertical surfaces of the excavations be treated prior to the placement of concrete.

4-2.13D Free Draining Granular Material

If required, the special provisions will direct the application of termite treatment over the granular fill to penetrate to the subgrade. The termite treatment should be applied just prior to the installation of the vapor barrier over the granular fill.

4-2.14 Cast-In-Drilled-Hole Concrete Piles

Reserved

4-2.15 Painted Pavement Markings

Reserved

4-2.16 Jacking Pipe Casing

Reserved

4-2.17 Other Sitework

The following items are frequently included in the scope of work for Caltrans building projects. In addition to being referenced in Division 02, *Sitework*, of the *Special Provisions*, they may also be referred to in the architectural, structural, mechanical, electrical, water and wastewater sections of the project plans and *Special Provisions*.

4-2.17A RV Sewage Disposal Station

Some roadside rest areas will require provisions for a septic tank disposal station for sanitary waste from recreational vehicles. The project plans within the wastewater sections will provide details.

4-2.17B Wash Water System

The wastewater runoff from wash racks is to be treated with a separate underground container system such as a three-cell clarifier. Details will be shown on the project plans within the wastewater section.

4-2.17C Communication Tower

If a communication tower or antenna system is required, details will be provided on the project plans within the electrical section.

4-2.17D Irrigation System

Refer to the project plans and the *Special Provisions* for the specifications. Details are normally shown on the project plans within the civil sheets.

4-2.17E Fencing

Fencing and gates are also shown on the project plans within the civil sheets. Additional details for electric and electronic operators and controllers, underground conduit, and monitoring systems may also be detailed in the electrical section of the project plans. If required, consult the project plans and the *Special Provisions* for requirements.

4-2.17F Guard Posts

Guard posts and bumper posts will be shown on the site plan and placed as protection around transformers, gas and water meters, and other locations around the site to prevent damage by vehicles or traffic. Details for the construction of guard posts are normally found in the project plans. Guard post foundations are frequently installed as part of the foundation concrete.

4-2.17G Parking Bumpers

Precast concrete parking bumpers are normally installed at staff parking areas. Review the project plans to determine how they are to be installed and the dimensions for locating them at the parking stalls.

4-2.17H Disabled Parking and Other Site Signage

Please review the standard details and Americans with Disabilities Act (ADA) compliant details on the project plans within the architectural section for sign requirements, locations, and details for their mounting.

4-2.17I Accessible Parking Signs

Reserved

4-2.17J Landscaping and Planting

Landscape planting is normally found within the civil plan sheets of the project plans.