



Construction Plans

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INTRODUCTION TO CONSTRUCTION PLANS

Construction plans are a representation of a project site and all activities that will be associated with the overall construction of the project. More specifically, a construction plan is a document that explains an entire construction project in detail including details of layout, design, and operational procedures.

Construction plans are a very important part of any construction project. They give contractors and subcontractors a visual of the proposed project, provide an orderly timeline and construction sequence, provide detailed standards and specifications, and give guidance in the day-to-day construction activities associated with the project.

This chapter gives a general overview of the purpose and contents of construction plans.

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Purpose

The purpose of a construction plan is to provide contractors and subcontractors with sufficient information to construct a project in the most efficient and cost-effective manner possible. To meet these objectives, construction plans must contain sufficient detail to adequately portray the layout of the project; identify areas of concern and provide measures to protect or overcome the identified concerns; provide an orderly timeline and construction sequence; provide detailed standards and specifications for various aspects of the project; provide a list of construction materials required for the project; and give appropriate guidance in the day-to-day construction process.

Content

The information in this chapter provides a general overview of the contents of a construction plan. Additional information may be required by regulatory authorities based on local, state, and federal regulations. It is the responsibility of the plan designer to identify specific requirements associated with applicable regulations and include that information in the construction plan.

In general, a construction plan should include an array of information that clearly depicts the overall project, including all construction activities and storm water management measures associated with the project. It should include but is not limited to a narrative about the project, project location information, predevelopment site conditions, a final project site layout plan, a drainage plan, a grading plan, and a storm water pollution prevention plan.

Construction Plan Index

In addition to the above, construction plans should include a plan index identifying the items that are contained in the plan and a reference as to where each item is located in the plan. An index is a key element to any construction plan and can be very useful to individuals using the plans as well as regulatory agencies who review the plans for compliance with local, state, and federal regulations.

The following sections in this chapter provide a brief overview of the key elements in a construction plan and their respective contents.

Plan Narrative

A plan narrative should be the first major element of any construction plan. A plan narrative is a written statement that describes the overall project. It should provide a clear understanding of the proposed project and can include a variety of items with the intent to inform, explain, and clarify issues associated with the site.

Construction plans require a variety of items. Some items and activities associated with a project may be portrayed more accurately in graphical or tabular form and located in a specific section of the construction plan while others may

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be adequately represented in the narrative. Therefore, there is no set standard for what should be included in a plan narrative.

Generally, a construction plan narrative will include items that do not have to be displayed in relation to other activities that will occur on the construction site. A few examples of items that could be discussed in the narrative section include a legal description of the project site, site characteristics, an explanation of expected pollutants associated with the project, construction schedules, operational procedures, and a general description of proposed storm water quality measures. Typically these items are not found on construction plan details sheets.

Project Location

Identifying a project's location is another key element of any construction plan. Typically, this information is provided as a graphical representation of the site as well as in narrative format.

Graphical identification of a project site is typically done by providing a vicinity map that depicts the site in relation to other identifiable areas in the city or county. Vicinity maps should contain sufficient detail so that someone unfamiliar with the area can locate the project site. U.S. Geological Survey topographic maps, county road maps, city street maps, custom drawn maps, etc. are acceptable types of vicinity maps as long as they adequately depict the site's location. Vicinity maps are typically placed on the cover sheet of the construction plan.

Narrative depiction of a project site is generally done by identifying the project site to the nearest quarter section, including township and range coordinates and civil township. Latitude and longitude coordinates identifying the approximate center point of the project should also be provided. Latitude and longitude coordinates can be obtained from U.S. Geological Survey topographic maps or from various Web sites.

Predevelopment – Existing Site Conditions

All construction plans should provide a representation of the project site that includes predevelopment conditions and existing site features. This information is extremely valuable in developing subsequent components of the construction plan. This element of a construction plan typically includes but is not limited to the following items.

Existing Vegetative Cover

A predevelopment plan should delineate and identify the existing types of vegetative cover such as grass, trees, brush, and so on. It is not necessary to identify individual species of plants.

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Identification of vegetative cover serves two primary functions. First, it provides the plan designer needed data when making storm water calculations for the project's storm water management system. Second, it provides a basis for evaluating the location, appropriateness, and adequacy of proposed storm water quality measures.

Adjacent Land Use

Predevelopment plans should clearly identify the land use of the upstream watershed and other areas adjacent to the project site. This information provides a basis for evaluating the effects that storm water runoff and pollutants associated with upstream watershed land use (e.g., single-family residential, multi-family residential, commercial, industrial, agricultural, woodland, etc.) might have on the proposed project site. It also aids in projecting what impacts a project might have on downstream watersheds and sensitive areas.

Site Topography

Existing site topography is critical in evaluating where storm water discharges will flow off-site and can be used in conjunction with final site topography information to evaluate areas and quantities of soil cut and fill. Existing site topography also provides a basis for evaluating the location, appropriateness, and adequacy of proposed storm water quality measures.

Site topography is typically depicted through the use of topographic contour lines or spot elevations. When using spot elevations, there should be a sufficient number of points to be able to visualize the site topography. To properly analyze and evaluate this information, all topographic lines, elevation numbers, and spot elevations must be legible.

In the case of linear projects such as highways, roads, utility lines, etc., cross-sectional views and plan and profile views of the project are generally acceptable since it is often difficult to show topographic contour lines or spot elevations for these kinds of projects.

Soils Information

Soils information should be an integral part of a project site's construction plans. The plans should contain a soils map and corresponding soils map unit legend that delineates and identifies the soil types located on the project site. A legible copy of the appropriate soils map taken from the U.S. Department of Agriculture Natural Resources Conservation Service county soil survey in the county where the project site is located is sufficient. Soils maps prepared by a professional soil scientist, soil boring logs, and geotechnical soils reports are also acceptable.

In addition to a soils map, the construction plans should include a discussion of the soil characteristics, limitations, and hazards associated with the project site

and the measures that will be integrated into the project to overcome or minimize any adverse soil conditions. For example, if on-site sewage disposal systems are proposed for use on a single-family residential project site, the plan designer should provide information in regard to soil limitations such as a seasonal high water table, slow permeability, poor filtering qualities of the soil, and so on. The plan designer should also identify measures that can be integrated into the project to minimize the respective soil limitations. In the above scenario, the plan designer might specify that perimeter subsurface drainage tile are required to lower the seasonal high water table and minimize the wetness limitation or that a modified on-site sewage disposal system must be installed to compensate for the slow permeability or poor filtering qualities of the soil.

Soil properties also need to be considered when selecting post-construction storm water quality measures for a site. Many structural post-construction measures are designed based on the soil's natural ability to allow infiltration of storm water. If infiltration is too rapid, there is little time for removal of pollutants and storm water treatment. If infiltration is too slow, there is potential for the measure to fail.

Wetlands, Lakes, and Watercourses

Wetlands, lakes, and watercourses that are on or adjacent to a project site should be identified on the predevelopment plan. This information is important in evaluating proposed storm water measures and ensuring that they are appropriate and adequate to minimize water quality impacts to natural, sensitive areas both on and adjacent to the project site. Also, identification of nearby watercourses and waterbodies may place additional importance on sediment control in a particular area of the project.

Potential Discharges to Ground Water

Areas of potential ground water recharge should be clearly identified and located in the construction plans. These areas can have a profound effect on ground water quality.

Existing features such as sinkholes and abandoned, uncapped wells can serve as a direct conduit for contaminated surface water to enter ground water. Therefore, it is extremely important to protect these areas if they occur on or downstream of a project site. In addition, storm water infiltration measures such as drywells, which may be planned as part of the project, could have a potential impact on ground water quality.

Once identified, adequate measures should be incorporated into the construction plans to prevent storm water runoff from entering ground water recharge areas or, at the very least, provide for some type of storm water pretreatment before it is allowed to enter ground water. For example, abandoned wells should be properly capped.

Final Project Site Layout

A final project site layout plan is an integral part of a construction plan. It provides a visual representation of what the project will look like after construction is completed.

Typically, a final project site layout plan identifies the location of lot boundaries, lot numbers, utilities, and streets including street names if available. It also identifies common areas such as community parks and greenways. On smaller residential projects and on commercial and industrial projects, the final project site layout plan may also show the proposed location of structures and parking areas.

Drainage Plan

Drainage plans are one of the most important elements of any construction plan. A drainage plan identifies how storm water will be managed on a particular project and determines what effect the project's storm water management system will have on adjoining properties and infrastructure. Elements of a drainage plan typically include but are not limited to the following items.

Site Topography

Drainage patterns and location of the drainage system is generally determined based on the topography of the site. Site topography is typically depicted through the use of topographic contour lines or spot elevations. When using spot elevations, there should be a sufficient number of points to be able to visualize the site topography. To properly analyze and evaluate this information, all topographic lines, elevation numbers, and spot elevations must be legible.

As noted earlier in this chapter, existing site topography is critical in evaluating where storm water discharges will flow off-site. Similarly, final site topography is critical in evaluating where post-construction storm water discharges will flow off-site and the location, appropriateness, and adequacy of proposed storm water measures. Therefore, it is important that a drainage plan show both existing and proposed site topography.

Existing site topography is typically depicted using a dashed or solid contour line, whereas final site topography is generally depicted using topographic contour lines that have a darker line density or through the use of spot elevations. In the case of linear projects such as highways, roads, utility lines, etc., cross-sectional views and plan and profile views of the project are generally acceptable since it is often difficult to show topographic contour lines or spot elevations for these kinds of projects.

Location of Storm Water Drainage System

Nearly every drainage plan identifies the location of all proposed storm water drainage systems such as swales, drainage channels, piping, culverts, etc. associated with a project and indicates the respective sizes, dimensions, and construction details of the various drainage system components. Drainage plans should also identify all points where storm water discharges will leave the project site. If the plan's topographic contour lines or the storm water drainage system does not clearly define off-site discharge points, these points should be identified with a note(s) placed on the plan.

Storm Water Calculations

Most drainage plans include design data, such as pipe sizes and discharge rates, for sizing of storm water management systems. In addition, drainage plans often include sizing and trap efficiency data for sediment traps, sediment basins, open channels, grassed swales, and so on.

Drainage plan design data is generally given for both preconstruction and post-construction conditions. This is done to show the overall impact the project may have in relation to storm water runoff quantities and velocities and potential impacts on adjoining land uses.

Drainage plan data is generally arrived at by calculating the size of the drainage area for each structure or measure and a specific-sized storm event. The two most commonly used storm events are the 10-year frequency, 24-hour duration event and the 100-year frequency, 24-hour duration event.

Storm water calculations can be done via several methods. Some of the more common and acceptable methods are the rational method, Technical Release Numbers 55 and 20.

Receiving Waters

Drainage plans should identify all named streams or other waterbodies that may potentially receive storm water runoff from the project site. If the discharge is to a municipal storm sewer system, the plan should identify the owner of the storm drain system as well as the ultimate receiving water for the storm drain system.

Floodplains

Floodplains, floodways, and floodway fringes that are located on a project site should be delineated on the drainage plans. In situations where there is no floodplain, floodway, or floodway fringe on the project site but one exists within close proximity of the project area, the construction plans should show the feature(s) delineated on the drainage plan. At a minimum, include a discussion of their existence in the narrative or on the plans.

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When there are no floodplains, floodways, or floodway fringes associated with the construction project, a note should be placed either on the graphical representation of the drainage plan or in the project narrative stating that none exist.

Hydrologic Unit Code

Hydrologic unit codes are used to identify specific watersheds. This information is often used by local governmental entities to identify an individual watershed or watersheds and to analyze and compare various activities between watersheds. Local watershed groups also use this information to implement watershed studies and apply for funding to implement watershed plans.

Hydrologic unit codes are generally expressed in terms of 6-, 8-, 11-, or 14-digit codes. A 14-digit code represents the smallest watershed delineation and is probably the most often requested by local organizations and governmental entities.

Grading Plan

A grading plan is an integral part of any construction project.

Graphically, a grading plan should identify and delineate the construction limits for all earthmoving activities associated with a construction project. The extent of disturbance has a profound impact on what storm water quality measures may be necessary to adequately control erosion and the resulting sedimentation.

Grading plans should also depict the existing and proposed topography of the site. Typically this is done by delineating continuous contour lines or identifying spot elevations on the grading plan. In the case of spot elevations, it is important to have a sufficient number of locations to be able to visualize the site topography. This information is critical to the project planner and grading contractor because it allows them to calculate the areas and quantities of soil cut and fill that may be associated with the project. Often, it is beneficial to provide the cut and fill quantities in tabular format.

Grading plans should identify the potential location of soil stockpile areas, borrow areas, and soil disposal areas. Soil stockpile and borrow site locations can alter the direction of storm water flow during construction activities and can have a significant impact on the selection, location and adequacy of the storm water quality measures.

Often, borrow and disposal areas may occur outside the property boundaries of the project site. In these instances, it is important that project site owners realize all land-disturbing activities associated with their project must comply with Indiana's storm water rule for runoff associated with construction activity. The rule is found in the Indiana Administrative Code under Title 327, Article 15, Chapter

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5 (327 IAC 15-5). Unless these off-site borrow and disposal areas are commercially operated facilities permitted under other state regulations, they may need to be identified and included as part of the project site owner's plan submittal or as a separate project.

If a construction project does not have any planned soil stockpiles, borrow areas, or disposal areas associated with it, this should be stated as a note on the grading plan or in the narrative of the construction plans.

Storm Water Pollution Prevention Plans

A storm water pollution prevention plan is a working document that identifies potential pollutants associated with a project and serves as a blueprint for the selection, installation, and maintenance of construction and post-construction storm water quality measures designed to control or reduce the impact of the pollutants. It also specifies how storm water will be managed at the project site. A storm water pollution prevention plan should be part of the general construction plan and not a stand-alone document because of its interrelationship with other plan components. It is also important to understand that changes to one or more facets of the construction plans can drastically affect provisions that have been identified in the storm water pollution prevention plan.

The purpose of a storm water pollution prevention plan is twofold. First, it serves as the principle site reference identifying storm water quality measures that need to be implemented to reduce erosion and minimize the discharge of sediment and other pollutants associated with the project. The second purpose of a storm water pollution prevention plan is to address the reduction of pollutants associated with a project's post-construction land use. In order to choose the appropriate storm water quality treatment measures to meet these objectives, the plan designer must have an understanding of the project site, the intended land use, and the associated pollutant sources.

Development and implementation of a storm water pollution prevention plan should be done by individuals who have an understanding of storm water issues and erosion and sediment control because proper development and implementation is critical if pollutants are to be adequately reduced or controlled. Development of a storm water pollution prevention plan must address planning of the project, the assignment of responsibilities and resources, performance expectations, and standards for monitoring performance compliance.

Storm water pollution prevention plans contain an array or variety of storm water quality measures that are designed to protect water quality. In general, a storm water pollution prevention plan can be divided into two different components: (1) an erosion and sediment control plan and (2) a post-construction pollution prevention plan. Each of these plan components should identify and clearly convey

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when, where, and how each storm water quality measure will be installed and maintained. At a minimum each component should contain the following items.

- Appropriate storm water quality measures.
- Location of each measure on the project site.
- Design standards and specifications for each measure.
- Installation criteria for each measure.
- Construction schedule describing the implementation/installation of the storm water quality measures relative to land-disturbing activities.
- Maintenance of all storm water quality measures.

Many of the storm water quality measures identified in a storm water pollution prevention plan will be implemented throughout the life of the project. It is important to recognize that some post-construction measures can be modified to control sedimentation during a project's construction phase and then modified to its original design to treat post-construction storm water runoff and pollutants after construction has been completed.

Associated Local, State, and Federal Water Quality Permits

On many projects, numerous local, state and federal water quality permits are required. Often, it is beneficial to include a listing of associated water quality permits within the storm water pollution prevention plan, in the project narrative, or on appropriate plan sheets. This facilitates coordination of the permitting processes and can prevent lengthy delays of a project.

The types of water quality permits associated with construction projects include but are not limited to:

- Construction in a Floodway Permit from the Indiana Department of Natural Resources' Division of Water.
- National Pollutant Discharge Elimination System Permit from the Indiana Department of Environmental Management's Office of Water Quality.
- Section 401 Water Quality Certification Permit from the Indiana Department of Environmental Management's Office of Water Quality.
- Section 404 Water Quality Permit from the United States Army Corps of Engineers.

Later chapters of this manual will provide more in-depth discussion and instruction on the development and implementation of storm water pollution prevention plans and the selection of storm water quality measures available to reduce or control pollutants associated with a project's construction and post-construction activities.

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