

SECTION 1400 Project Development

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1401 Design Review Process

1401.1 Introduction

Transportation projects originate from a wide variety of sources, including local governments or private entities requesting to construct improvements on roadways under the Department's control. In order to streamline project development and avoid unnecessary delays, these projects are required to follow ODOT's Project Development Process (PDP). ODOT's **Project Development Process** is a project management and decision-making process, which provides a team-oriented approach to developing a transportation project. It is the framework for project development and guides it from conception through completion. The PDP also establishes the scope of work for a project and its deliverables.

This section of the **Location and Design Manual** provides a general overview of plan development. It does not detail design standards, nor provide guidance on how to evaluate any particular design component or environmental issue. Design and environmental requirements are provided in various technical manuals and policies.

See the [Project Development Process Manual](#) and the [PDP website](#) for more information.

1402 Project Phases



The [Project Development Process](#) (PDP) is a project management and transportation decision-making tool that outlines project development from concept through completion. It encourages communication among disciplines, eliminates duplication of effort, minimizes cost overruns, and provides for early identification of potential issues. For example, by identifying environmentally sensitive resources early in the PDP process opportunities to minimize direct impacts are afforded, thereby resulting in the production of quality plans.

The PDP consists of five phases that projects must advance through. These phases are: Planning (PL), Preliminary Engineering (PE), Environmental Engineering (EE), Final Engineering/ROW Phase (FE), and Construction (CO). Depending on the project's size, complexity, and/or potential impact to the environment, the amount of time spent in each phase will vary.

It is important to note that PDP phases represent conceptual groupings of activities. The activities from one phase do not necessarily need to be completed before advancing with activities in the next phase. For example, because right of way acquisition frequently falls on a project's critic path, it may be necessary to begin development of the Preliminary Right of Way during development of the the Alternative Evaluation Report (AER), prior to the selection of a preferred alternative. Under this scenario, elements of the Environmental Engineering phase occur while the project is still in the Preliminary Engineering phase.

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Preliminary Development

Preliminary Development highlights the focused attention to the Preliminary Engineering (PE) and Environmental (EE) phases of the Project Development Process (PDP) by linking them together. The combining together of these two areas of Preliminary Development defines them as the primary Preliminary Development decision points and provides better alignment with ODOT's internal funding phases. Although ODOT defines the PE and EE phases as having separate defined deliverables, for ODOT/FHWA finance coding, these two phases will be approved as one.

A brief overview of project phases is detailed in the following sections.

1402.1 Planning Phase (PL)

Planning is the first phase of the PDP and provides a starting point for decision-making. It creates the foundation upon which the later PDP phases depend and assumes that a transportation improvement is warranted to address a problem identified through a prioritization process. But it does not assume the specific project-level needs to be addressed, facility type or project to be constructed.

This phase utilizes a multi-disciplinary approach to:

- identify project specific needs & study area
- determine an operational or management solution to solve the identified transportation problem
- determine project phasing and location
- determine the scope, schedule and budget of the project

Planning efforts should balance the need to move people safely and efficiently while fostering transportation projects that preserve and enhance the natural and built environments, as well as the economic and social assets of the neighborhoods through which they pass.

More detailed information on the Planning Phase (PL) can be found in the PDP Manual.

1402.2 Preliminary Engineering (PE)

Preliminary Engineering begins the process of collecting more detailed information in order to develop and compare alternatives. This is done by conducting field investigations, performing technical studies, and developing preliminary engineering level of plans. This work builds upon, and refines, the information and analysis produced during the Planning Phase (PL). A primary product of Preliminary Engineering is the recommendation of the preferred alternative for the project. PE initiates the Stage 1 detailed design.

Although not an all-inclusive list, typical tasks performed during the PE phase are:

- Develop Feasibility Study and Alternative Evaluation Report
- Collect traffic data
- Conduct Safety Analysis
- Perform Environmental Field Studies
- Stakeholder consultation and public involvement for alternatives

More detailed information on the Preliminary Engineering Phase can be found in the PDP Manual.

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1402.3 Environmental Engineering (EE)

In the **Environmental Engineering (EE)** phase, detailed environmental analysis of the preferred alternative is performed concurrently with detailed engineering, and other technical studies.

The **EE** builds upon and refines the information and analyses produced during the **Preliminary Engineering Phase (PE)**. The intent of the process is to have refined environmental studies and design work initiated concurrently on the preferred alternative, along with solid decision-making.

Based on the understanding of potential environmental impacts, a determination is made by the project team regarding the necessary level of environmental field studies and regulatory agency coordination needed for the project.

More detailed information on the **Environmental Engineering Phase** can be found in the **PDP Manual**, located on the Office of Environmental Engineering's website.

1402.4 Final Engineering/ROW Phase (FE)

During the **Final Engineering/ROW Phase**, projects are advanced to full development.

The acquisition of any necessary right of way is finalized in this phase, but the process is flexible. Acquisition can occur early, before environmental review is completed, piecemeal as part of a design-build project, or traditionally after the environmental review is completed and the right of way plans are completed.

Stage 3 detailed design is also completed during this phase. Plans must contain all details and quantities required to bid and construct the proposed project, including a final cost estimate. A Stage 3 Detailed Design Review Submission must also be reviewed and approved by the District. It is recommended that a second Stage 3 Detailed Design Review be conducted if more than two years have elapsed since the first Stage 3 Detailed Design Review, and the Final Tracing Package has not been submitted to Central Office.

The Project Manager is responsible for ensuring:

- project has been fully developed,
- all necessary legislation has been completed,
- PS&E package has been finalized,
- performance of any other technical and engineering tasks,
- Plan Package meets all construction schedule deadlines.

Before the project can proceed to the next phase, the **Final Plan Package** is prepared and submitted to the ODOT **Office of Estimating**.

More information on the **Final Engineering/ROW Phase** can be found in the **PDP Manual**, located on the Office of Environmental Engineering's website.

1402.5 Construction (CO)

The **Construction Phase** can be defined as the execution and administration of the contract documents, and is the final step in the Project Development Process (PDP). It begins when the **Final Plan Package** has been submitted to Central Office. After the contract is awarded, ODOT monitors, manages, and documents the contractor's activities to ensure compliance with the plans, proposal, and specifications.

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The Contractor is responsible for constructing the work as detailed in the contract documents. The Project Engineer is responsible for ensuring that the terms of the construction contract are fulfilled. The Contract is a written agreement between the Department and the Contractor, setting forth the obligations of the parties, including, but not limited to the performance of the work and the basis of payment. Requirements for the management of the contract after the award can be found in the Construction Administration Manual of Procedures and the ODOT Construction and Materials Specifications (CMS).

More information on the **Construction Phase** can be found in the PDP Manual, located on the Office of Environmental Engineering's website.

1403 Project Classification

ODOT projects fall into one of five path categories (Path 1-5). Selection of the appropriate project path is based on the project's size, anticipated level of project complexity and/or potential impact to the environment. The project's path identifies the recommended level of analysis, amount of stakeholder involvement, and activities performed during each phase. For classification purposes, the relative complexity of a project should be evaluated on a statewide, rather than a district-wide basis.

Since the initial path selected for a project is frequently based upon limited information, it is recommended that it be reevaluated at the conclusion of planning activities to determine if it is still the best choice. ODOT's **Project Development Process (PDP)** provides the flexibility to reclassify a project's path to fit unanticipated requirements which may develop. It's important to reclassify a project as early in the project development process as possible to avoid any delay in its progress.

When trying to determine which path a project should follow, it may be difficult to determine if it fits better in one category versus another. When this situation arises, it is recommended that the higher category be selected.

All larger, more complex (Path 3, Path 4 and Path 5) PDP projects will have a dedicated Project Manager to oversee project development through all development phases of the PDP.

More information on Project Path categories can be found in the following sections, and in the PDP Manual.

1403.1 Path 1 Projects

Path 1 projects are defined as "simple" transportation improvements generated by traditional and preventative maintenance. They may involve structure work and roadway resurfacing. From an environmental perspective, they are typically processed as low-level Categorical Exclusion (CE) NEPA documents.

Examples of **Path 1** projects are:

- Simple guardrail replacements, where roadway ditches and backslopes will not be relocated
- Traffic signal maintenance, provided that no work occurs within any historic district and there is no likelihood of encountering contaminated materials
- Mowing, trimming, or brush removal
- General highway maintenance (i.e., filling potholes, crack sealing, joint repair, installation or maintenance of signs, pavement markings, raised pavement markers)

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- Bridge painting and bridge deck overlays provided the project does not involve work within streams, rivers, scenic river corridors, or historic properties

1403.2 Path 2 Projects

Path 2 projects are simple transportation projects which include minor structure and roadway work. They involve non-complex structure, or roadway work. These jobs can include minor ROW acquisition (i.e., strip takes, temporary easements). **Path 2** projects are typically low-level Categorical Exclusion (CE) NEPA documents and will likely have one viable alternative.

Examples of **Path 2** projects are:

- Bridge rehabilitation and in-kind bridge replacement
- Culvert rehabilitation/replacement
- Resurfacing and shoulder widening (no capacity additions)
- Isolated intersection improvements including turn lane additions, roundabouts, restricted crossing U-turns, etc.

1403.3 Path 3 Projects

Path 3 projects involve a higher level of difficulty than projects in Paths 1 or 2. These projects are generally located on an existing alignment, although to improve geometric conditions small adjustments to the existing alignment and which do not result in significant environmental impacts may be involved. They involve moderate roadway and/or structure work and may include capacity additions. They can also involve utility relocations and ROW acquisitions, including relocations. Due to the wide range of potential impacts, and the amount of right of way required, **Path 3** projects can fall under a wide range of environmental document levels, from C2 through D3.

Examples of **Path 3** projects are:

- Median widenings
- Geometric realignments
- Interstate reconstruction and/or median widening
- Auxiliary lane additions
- Interchange reconstructions

1403.4 Path 4 Projects

Path 4 are defined as transportation improvements where the anticipated result of the improvement is expected to have a significant impact to the highway's public access, level of service, traffic flow, mobility patterns, or mode shares. They include roadway and structure work which could add capacity, affect existing horizontal/vertical alignments, and involve consideration of complex and competing interests.

Although typically located on new alignment, **Path 4** projects could include any project type that might impact high-quality environmental resources, have substantial public controversy, require substantial right of way acquisition, regular agency coordination at several decision points in the PDP, and result in the examination of multiple alternatives as a necessary to aid in the systematic progression of selecting the preferred alternative.

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The context and intensity of impacts should be considered when addressing the impact to environmental resources. **Path 4** projects may require a higher-level CE, Environmental Assessment (EA), or Environmental Impact Statement (EIS) NEPA document.

Path 4 example projects are those which:

- make significant changes to existing horizontal and/or vertical alignment, resulting in the examination of multiple alternatives
- are located on a new highway alignment in a rural setting
- may impact high-quality environmental resources

1403.5 Path 5 Projects

Mostly urban transportation improvements, **Path 5** projects involve the highest complexity of design work; have a higher probability of public controversy, multiple alternatives, and complex utility and access management issues.

In addition to requiring a substantial financial investment, **Path 5** projects can be expected to have a significant impact on the highway's level of service, traffic flow, mobility patterns, mode shares and right of way.

From an environmental standpoint, **Path 5** projects include any project type in an urban setting that might impact a high-quality environmental resource or require agency coordination at several decision points in the PDP. They're typically higher level NEPA documents and require an Environmental Impact Statement (EIS) or an Environmental Assessment (EA) NEPA document, but in some instances could be processed as a high-level Categorical Exclusion (CE) NEPA document. The context and intensity of impacts should be considered when addressing an impact to an environmental resource. The District Environmental Coordinator or the Office of Environmental Services should be consulted if assistance is needed in determining the appropriate level of NEPA document that will be required for the project. Additional scoping reviews before acceptance may be required.

More information on **Path 5** projects can be found in the [PDP Manual](#).

1404 Review Process Determination

The District shall ensure every ODOT project is reviewed for compliance with the Scope of Services. There are several review categories in which a project may fall:

- Staged Review
- Limited Review
- Design-Build
- Local-Let Development Process

The review process which may be applied to a project is based upon its path and is determined by the District office. Irrespective of the number, or the detail of review submittals required, the **Designer of Record** is responsible for plan accuracy and adherence to all design and plan preparation requirements.

A description of each review process can be found in the sections which follow.

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1404.1 Staged Review Process

The **Staged Review Process** consists of a series of review submissions at various stages of the design process. As the number of project alternatives is reduced, the level of design detail increases.

The Staged Review Process may be customized by combining review submissions and/or modifying the content of individual review submissions. Customizations of the **Staged Review Process** must be listed in the project's Scope of Services document.

The Districts shall ensure that plans processed through the **Staged Review Process** are reviewed for compliance with the Scope of Services and to ensure compliance with current specifications, standards, policies and procedures.

1404.2 Limited Review Process

The **Limited Review Process** may be applied to Path 1, Path 2, and Path 3 projects which have a well-defined scope, limited environmental impact and utility involvement. Except for the Feasibility Study, **bridge projects**, and Final Right of Way plans, ODOT will not review the plans for accuracy and adherence to design and plan preparation requirements. **However, projects must still be in compliance with the Scope of Services.**

Although design activities associated with Stage 1 Detailed Design, Stage 2 Detailed Design, Stage 3 Detailed Design, and Preliminary Right of Way must be performed, their review submittals may be omitted. If no temporary or permanent right of way is to be acquired, the Final Right of Way Plan review submission may also be omitted.

External agency approvals (e.g. FAA Notification/Clearance, Waterway Permits, LD-33 County Engineer Approval, Railroad Agreements), and Central Office approvals (e.g. Design Exceptions, Maintenance of Traffic Exceptions Committee, and Waterway Permit determination) must be obtained.

The **Design Agency shall receive acceptance from the District for** any minor design decisions that occur after the Feasibility Study. The **Design Agency** must notify the District with the description of each alternative and an assessment of the impacts of each alternative on project cost, traffic operation, right of way cost, utility relocations, environmental impacts and any other associated impacts.

Below are typical design review submittals required by the **Limited Review Process**:

- Project Initiation Package
- Feasibility Study
- Final Right of Way

It is important to note that the **Limited Review Process** cannot be applied to projects requiring Federal oversight. The Federal Highway Administration (FHWA) is responsible for ensuring that all federal-aid highway programs are delivered consistent with established requirements.

1404.3 Design-Build Review Process

Design-Build projects combine the detailed design and construction of a project into a single contract. The **Design Agency** and construction contractor form a team. They work concurrently on the design and construction phases of a project, which expedites project delivery.

For Path 1 projects, the **Design-Build** team will submit Stage 3 Detailed Design plans (without quantities)

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for review and **acceptance**. Other reviews are not normally required.

For higher path projects, the **Design-Build** team will submit Stage 1 and Stage 2 Detailed Design for review and **acceptance**. The **Design-Build** team may design and submit Stage 1 and Stage 2 information in phases consisting of buildable units (i.e., earthwork, pavement replacement, etc.) for review. The scope and design shall be coordinated with the District and authorization must be granted prior to submitting various plan components for review.

All external agency approvals (e.g., FAA Notification/Clearance, Waterway Permits, LD-33 County Engineer Approval, Railroad Agreements) and Central Office approvals (e.g., Waterway Permit Determinations, Design Exceptions, Maintenance of Traffic Exceptions Committee) must be obtained.

Additional information on the **Design-Build** process can be found at the following link:

http://www.dot.state.oh.us/Divisions/ConstructionMgt/design-build/Pages/Design_Build.aspx

1404.4 Local-Let Local Public Agency (LPA) Project Review Process

LPA projects are transportation improvement or enhancement projects that are funded primarily with federal or state monies, and if required, matched with local resources. Traditional LPA projects are those administered by ODOT, whereas **Local-let LPA** projects are those in which the LPA assumes project administration duties.

To the extent practical and feasible, ODOT will minimize its direct involvement in the design and delivery of projects that are funded with local and federal monies, or local and state monies, which do not directly involve routes on the National Highway System. Local public agencies may voluntarily assume the responsibility for project management tasks as determined and in coordination with the ODOT District Office.

For these local-let LPA projects, review submittals shall be as detailed in the **Locally Administered Transportation Projects Manual of Procedures**. ODOT-Let LPA Projects will follow the **Project Development Process**.

1404.5 Customization of Review Requirements

The PDP's phased approach allows for the customization of a project's review process. It allows for more flexibility between project phases and allows the Project Manager to tailor the process to meet the project's individual needs.

The Staged Review Process may be customized by adding review submissions, combining review submissions and/or modifying the content of individual review submissions. Customizations of the Staged Review Process must be listed in the project's scope of services document. These customizations should be evaluated on a case-by-case basis by ODOT personnel prior to scoping. During the scoping process, Consultants are encouraged to submit suggestions for modifications that allow for more effective use of resources, while still providing adequate evaluation of design and environmental issues.

1404.5.1 Combined Reviews

Combined Review submissions are recommended for relatively straightforward projects. Elements from each involved submission must be included in the combined submission. It is not acceptable to disregard elements associated with earlier deliverables and focus only on elements from the later review when they are necessary in the evaluation of the combined review submission (e.g., Path 1

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Preliminary Engineering) elements (e.g., Stage 1 Detailed Design).

1404.5.2 Modifications to Design Review Content

It is possible to make modifications to design review content by changing the order in which activities occur in the Staged Review Process. For instance, the timing of a design activity may be modified allowing it to occur earlier, or later, by moving it to another phase in the project development process. This may be justified when particular activities add significant cost to a project's design as a result of performing the task on multiple alternatives. The postponement of activities to a later phase must not diminish the **Design Agency's** ability to evaluate alternatives, or to adequately determine the project's scope, schedule, and budget. Conversely, review elements should be moved forward in the process when they can be obtained at relatively low costs and would add greatly to the **Design Agency's** ability to evaluate alternatives or determine scope, schedule, and budget. For example, in order to identify the Preferred Alternative, a Path 3 project may require investigating a vertical profile during the development of the Feasibility Study, even though this task is listed under the Alternative Evaluation Report (AER) tasks. Alternatively, to avoid investigating structure details on alternatives which are eliminated, a Path 3 project considering multiple alignments for a stream crossing may delay the Structure Type Study until the AER.

There is a limitation on the modification of design review content. For instance, when federal funding is used for design work, the environmental document must be approved prior to the authorization of final design activities (i.e., Stage 3 Detailed Design) and/or any Right of Way acquisition.

1404.6 Scheduling

Good scheduling helps a project to run smoothly and helps to ensure it is completed in a timely manner. When developing schedules, particular attention must be paid to items that fall on the critical path (e.g., Right of Way acquisition, utility relocation, individual 404/401 permits, etc.) and items that must be completed during a particular time of year (e.g., aerial mapping, ecological studies, etc.)

In ODOT's **Project Development Process**, Gantt chart schedules are used to coordinate the various tasks associated with project development against time. Consultants are required to submit updated Gantt chart schedules each month which include baseline, actual, and current finish dates. The Project Manager must **accept** any modification to the schedule which alters commitment dates.

Projects which are behind schedule must include a recovery plan.

1405 Review Agencies

With the exception of external agency coordination performed by the **Office of Environmental Services**, all review submissions must be coordinated by, and are the responsibility of, the District. This ensures consistency of review comments, scope compliance, and project intent.

Submissions may be reviewed by the District Office, Central Office, an external agency, a resource agency, or one contracted by ODOT for all (or part) of the submission. External reviews may be necessary based upon agreement (i.e., Memorandums of Understanding (MOU), Memorandums of Agreement (MOA)). The determination of an external review will be made during the design Scope of Services meeting.

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1405.1 Ohio Department of Transportation

The District Project Manager is the first point of contact for all review questions. The Project Manager:

- verifies required review information is submitted in accordance with the project schedule.
- ensures review comments are appropriately addressed.
- coordinates the appropriate and timely execution of reviews, not only within the District, but Central Office as well.

1405.1.1 Technical Offices and Specialty Areas

Projects prepared by the District office may require a review by a technical office or specialty area. **Figure 1405-1** lists ODOT Central Office Technical Specialty Areas. At the District's request, these offices/specialty sections will assist in the review of unique or complex items.

1405.1.2 Central Office

Projects prepared by the District Office should be submitted by the Project Manager directly to each involved office, or technical specialty area, for review. **Figure 1405-1** lists ODOT Central Office Technical Specialty Areas. Reviews must be conducted by someone other than the project designer.

For projects developed by a consultant, there are two methods for sending review submissions to Central Office:

1. Documents are submitted directly to each involved office or technical specialty area. The consultant should provide a copy of all transmittals to the Project Manager.
2. Multiple copies of the review documents are submitted to the Project Manager for distribution to each involved technical office and/or specialty area.

The consultant Scope of Services document should address which method of submission is desired by the District.

1405.2 Federal Highway Administration

The **Federal Highway Administration (FHWA)** is accountable for ensuring that all Federal-aid highway programs are delivered consistent with established requirements. The **Federal-Aid Highway Program Stewardship and Oversight Agreement** outlines the respective roles and responsibilities of ODOT and the **FHWA** in administering the federal-aid program. **Figure 1405-2** outlines the Federal Oversight determination process.

At the time of programming, the District will determine the level of oversight required on a project and enter it into Ellis. On projects subject to federal oversight, the **FHWA** and ODOT should discuss which submissions should be sent to the **FHWA**. For federal oversight projects, a copy of all required review submittals must be furnished directly to the **FHWA** by the preparing agency, or local government. Due to fluctuations in workloads, the **FHWA** may request federal oversight on a project that would normally be State administered.

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1405.3 Local Governments

When the Design Agency is working for a local government, the local government may either have review materials processed through its office or have the preparing agency make submittals directly to the District Office. In either case, unless otherwise notified, ODOT will assume the submittal reflects the intent and desires of the local government.

1405.4 Other Governmental Agencies

Review and approval from the **Federal Aviation Administration (FAA)**, **U.S. Army Corps of Engineers (USACE)**, **Federal Emergency Management Agency (FEMA)**, **U.S. Coast Guard**, **U.S. Fish and Wildlife Service**, **Ohio Department of Natural Resources (ODNR)**, **State Historic Preservation Office (SHPO)** and **Ohio Environmental Protection Agency (OEPA)** may be required.

Other required environmental approvals and agency coordination are detailed in various manuals, and handbooks, published by the **Office of Environmental Services**.

Submissions to the environmental resource agencies (e.g., the **Bureau of Underground Storage Tank Regulation**, **Ohio Department of Natural Resources**, **Ohio Environmental Protection Agency**, **Ohio Department of Agriculture**, **National Park Service**, **State Historic Preservation Office**, **U.S. Army Corps of Engineers**, **U.S. Coast Guard**, **U.S. Department of the Interior**, **U.S. Fish and Wildlife Service** and **U.S. Environmental Protection Agency**) must be submitted through the **Office of Environmental Services**. Contact the **Office of Environmental Services** for more information.

1405.6 Railroads

When railroad property falls within the work limits of a proposed project, the possibility of railroad involvement exists. Rail companies must be informed at an early stage of plan development whenever their facilities may be affected in any manner. Some examples include; work on structures passing over a rail line, new grade separations, reconstruction or rehabilitation of existing grade separations, drainage work, removal of Right of Way encroachments, utility work, etc. In addition, projects with an intersection within the projects limits, located within 400 feet of an at-grade rail crossing, require coordination with the **Ohio Rail Development Commission** to determine the need for preemption.

All projects with rail involvement must be coordinated with the **Central Ohio Railroad Coordinator** who is responsible for preparing, and processing, all railroad construction agreements. The construction agreement process is initiated at Stage 1 and finalized at Stage 3. The District is required to send a copy of the final plans to the affected railroad company.

For projects involving of rail Right of Way, the involved rail company will be allowed an opportunity to comment on the Right of Way plans and legal descriptions associated with acquisition of their property. The **Acquisition Support Section** in the **Office of Real Estate** coordinates the acquisition of Right of Way from rail companies.

1406 Design Review Submittals

Review submissions are designed to ensure that all projects are developed in **compliance with the Scope of Services**, ODOT standards, and policies. The Project Manager is responsible for verifying that all required review information is submitted in accordance with the project's schedule, and that review comments are appropriately addressed. Information regarding the content requirements of each review submission can be found within the appropriate ODOT technical manuals and webpages (e.g., **Waterway Permits Manual**, **Right of Way Plan Manual**).

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1406.1 General Requirements

Each review submission includes a list of design activities. Therefore, each project should be scheduled based on its required design activities and anticipated design development timeframes.

There may be instances where specific design recommendations may come from someone other than the **Designer of Record** responsible for the overall project design. For example, a sub-consultant might prepare the Geotechnical Exploration Report whose recommendations are incorporated into the project's plans by the prime consultant. To ensure that their recommendations have been correctly interpreted and incorporated into the project's design, the sub-consultant should be given an opportunity to review the plans prior to their submission to ODOT.

Unless otherwise noted in the Scope of Services document, all review submissions should be sent to the District office. Multiple copies and direct submittals to Central Office and external agency reviewers may be required. Care should be taken to ensure that each submission includes all information required to process the review. Review submissions that lack required information, or contain inaccuracies which preclude meaningful review, will be rejected.

Since right of way acquisition is frequently on the critical path for overall project development, preliminary Right of Way plan preparation and Stage 2 Detailed Design should be developed concurrently. Final Right of Way plan development will normally occur immediately after preliminary Right of Way approval.

The following sections provide information for design review submission. No attempt has been made to either detail design standards or to provide guidance on how to evaluate any particular design component, or issue. Design standards are provided in the technical manuals and design policies listed in **Figure 1405-1**.

1406.1.1 General

All submissions must include the following in the letter of transmittal:

- Project identification: County, Route, Section (Street Name), PID number, Federal number or program (if known).
- Identification of the type of review submission
- Indication of any local government involvement along with any comments the local government may have regarding the submission
- Explanation of any special items, situations, or potential problem areas
- Disposition of previous review comments
- A current cost estimate factored up to the year the project will be awarded and indicating reasons for any significant increase, or decrease in project cost
- Identification of all plan sheets, reports, and other materials

When both environmental and design documentation are required to complete a review, all documentation should be submitted at the same time. A sufficient number of copies of all submissions must be provided to allow for adequate review by all involved parties.

1406.1.2 Format

The format and number of copies required for all submissions is determined during the design Scope of Services meeting(s). For plan sets, quarter size 11" x 17" sheets are usually preferred. Plan sets must be bound. Calculations, reports and other documentation should normally be submitted on 8

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1/2" x 11" paper. Large size exhibits, or preliminary design work, may be needed for public involvement meetings. Multiple sets of documents may be required to facilitate the review.

Plan sheet image files shall be provided in PDF format. Text-based documents should be provided as searchable PDF files. With the exception of some local-let projects, plans shall be submitted in a PDF electronic image format in accordance with the requirements of the electronic image file submission procedures available on the Office of Contracts website.

The District may consider allowing electronic submittals in addition to, or as a replacement for, paper submittals. The number of paper or electronic copies required for a particular review should be addressed in the Scope of Services document and be based on previous project experience, existing inter-agency agreements, and/or information from the review agency.

All projects requiring submittal of CADD files shall be developed using Bentley or Autodesk products, in accordance with the [ODOT Guidelines for Electronic Design Deliverables](#), [CADD Engineering Standards Manual](#) and the project's Scope of Services document. See [Section 1503.1](#) for more information.

Some external agencies do not allow submission of electronic images. In instances where hard copy (i.e., paper) documents are required, the District Planning and Engineering Administrator will determine whether the hard copy document will be created by the District or by the consultant.

1406.1.3 Engineers Seal

All final submissions must be sealed by a Registered Professional Engineer in accordance with the Ohio Revised Code Sections 4733.14, 4733.17, and 4733.23. This includes not just final plan sets, but also Access Point Request documents and Design Exceptions. If an Engineer has been hired to prepare plans through the Final Plan Package Submittal, then only the final plans and supporting documentation must be sealed.

Situations may occur where the detailed design will not be developed by the same engineer, or design firm, who prepared the preliminary engineering. In this case, the detailed design Engineers may rely on the preliminary development completed and sealed by the preliminary engineering consultant as the basis for their design. This information should be noted on the Title Sheet of the plans.

1406.2 Project Initiation Package

Developed by the District, the [Project Initiation Package \(PIP\)](#) is a collection of information used to help define the necessary scope of work for a project. The PIP is produced early in the Planning Phase (PL) and is required for projects following Paths 2-5 of the PDP. Although it is unlikely that a project following Path 1 will require a PIP, it is possible that some technical and/or resource areas may need to be considered for some projects. In those cases, it is recommended that the PIP be utilized to document any issues.

The PIP uses secondary source data and is intended to provide a snapshot of potential issues and concerns that could cause major scope, schedule, or cost issues during project development. Specific points of concern are those which could cause revisions to any of the following: anticipated design and construction scope of work, proposed project development schedule, estimated project budget, or potential impacts of the project on the surrounding area.

Identification of areas of concern must be performed by qualified individuals with experience on similar projects. The PIP is generally prepared based on reasonable knowledge available at the time of project development. Existing data (e.g., old plans, USGS maps, Soil Conservation Maps) should be researched.

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In addition, the **Project Initiation Package** should include mapping overlaid on USGS or Aerial maps that identify environmental resources, and other areas of concern. A minimum of one site visit by qualified personnel to review the existing field conditions is mandatory.

Tasks associated with the completion of the PIP can be found in **ODOT's Scope and Fee (SAFe) System**. More information on the **Project Initiation Package** can be found at:

<http://www.dot.state.oh.us/projects/pdp/Pages/Resources.aspx>

1406.3 Feasibility Study (FS)

1406.3.1 General

The **Feasibility Study (FS)** is part of the Preliminary Engineering Phase (PE) of the Project Development Process. It is used to analyze project alternatives with an ultimate goal of identifying a preferred alternative for a project. The positives and negatives of each alternative should be analyzed from a design and environmental perspective.

For Path 2 or Path 3, the **Feasibility Study** should result in the identification of a preferred alternative.

For Path 4 and Path 5 projects, the **Feasibility Study** should result in a limited number of alternatives for further analysis during the Alternative Evaluation Report. It may include development of corridors and associated horizontal alignments to avoid and/or minimize impacts to design and environmentally sensitive areas within the project study area.

The **Feasibility Study** is a combined design and environmental submission. Necessary tasks to complete a FS are detailed in the [Scope and Fee \(SAFe\) System](#). If at the time of scoping an additional detail beyond what is identified in the SAFe System is assumed to be necessary in order to make a decision on the preferred alternative, then adding tasks from the Alternative Evaluation Report (AER) is encouraged.

For more information on the format and review process for a Feasibility Study, refer to **Feasibility Studies and Alternative Evaluation Reports Guidance** at:

<http://www.dot.state.oh.us/projects/pdp/Pages/Resources.aspx>

1406.4 Alternative Evaluation Report (AER)

1406.4.1 General

The **Alternative Evaluation Report (AER)** is a combined design and environmental submission. Its purpose is to analyze alternatives developed in the Feasibility Study at a higher level of detail prior to recommending a preferred alternative. Completion of an **AER** as the first, or only, study of alternatives is not correct.

An **AER** is not required for projects where the outcome of the Feasibility Study results in the identification of a preferred alternative. When warranted, it should only be completed on complex Path 3, Path 4 and Path 5 projects.

Necessary tasks to complete an **AER** are detailed in the [Scope and Fee \(SAFe\) System](#). For more information on the format and review process for an **Alternative Evaluation Report**, refer to

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Feasibility Studies and Alternative Evaluation Reports Guidance at:

<http://www.dot.state.oh.us/projects/pdp/Pages/Resources.aspx>

1406.5 Stage 1 Detailed Design

1406.5.1 General

Stage 1 Detailed Design begins after the identification of a preferred alternative. It refines and builds upon the preliminary engineering design completed for the AER.

Stage 1 plans are developed to a sufficient level of design detail to ensure that Preliminary Right of Way plan development may begin immediately after completion. Construction limits should be accurate; with little or no changes anticipated due to Stage 2 development.

Stage 1 Detailed Design is part of the Preliminary Engineering (PE) Phase of the PDP. Path 1 and Path 2 projects do not typically require a **Stage 1 Detailed Design** submission. It is required for Path 4 and Path 5 projects, and for most Path 3 projects.

1406.5.2 Stage 1 Detailed Design Activities

Since each project is unique, Project Managers have the flexibility to determine which activities are necessary based on the project's scope. Therefore, there is no one-size-fits-all when it comes to the tasks necessary to complete a project's design.

Following are activities are typically part of a Stage 1 Detailed Design:

- Design Exception request
- Driveway details
- BMP design
- Drainage calculations
- Utility coordination and documentation
- Develop Retaining Wall plans
- Complete LD-33 County Engineer approval form.
- Detour Plan
- Traffic Control
- Signal plans
- Determine Right of Way costs
- Refine construction limits.
- Final Structure Site Plan
- Service Road Justification
- Railroad coordination
- Complete Airway/Highway Clearance Analysis, if not completed previously

For a complete listing of typical **Stage 1 Detailed Design** activities, see ODOT's [Scope and Fee System \(SAFE\)](#).

1406.5.3 Stage 1 Detailed Design Review Submission

After **Stage 1 Detailed Design** is finalized for a preferred alternative, the project can be moved into the next phase of project development. The **Stage 1 Detailed Design** must be submitted to the District for review and **acceptance**.

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Although each project is unique, there are certain key elements which are a part of the **Stage 1 Detailed Design Review Submission**:

- Title Sheet
- Schematic
- Typical Section sheets
- General Notes
- Plan and Profile sheets
- Cross Section sheets
- Superelevation table(s)
- Intersection Details sheets
- Driveway Detail sheets
- Culvert Detail sheets
- Channel Relocation Detail sheets
- Channel Section sheets
- Conceptual Maintenance of Traffic, if revised from previous submissions
- Preliminary Pavement Marking Plan
- Revised Systems Engineering Analysis for Intelligent Transportation System (ITS) projects
- Retaining Wall plans
- Geotechnical Reports
- Documentation of approved Interchange Justification Studies
- Documentation of approved Design Exception(s)
- Service Road Justification
- Drainage calculations
- LD-33 County Engineer Approval form
- Bridge Design report
- Retaining Wall plans
- Utility coordination and documentation
- Documentation of Airway/Highway Clearance Analysis, if not previously submitted
- Final Post Construction Storm Water Best Management Practices (BMP) Design Calculations and documentation of any BMP implementation issues

Refer to ODOT's Scope and Fee System ([SAFE](#)) task list for a complete list.

1406.6 Preliminary Right of Way Plan

1406.6.1 General

Preliminary Right of Way Plans are required for all projects that involve acquisition of temporary or permanent Right of Way, and should be prepared in accordance with the [Right of Way Plan Manual, Section 3100](#). They provide information to define the extent of the right of way required to construct and maintain a highway.

Since acquisition of property can be a long process that in many cases dictates the overall schedule of a project prior to construction, preliminary right of way plans should be developed concurrently with Stage 2 detailed design. They should incorporate all Stage 2 review comments related to right of way issues.

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1406.6.2 Preliminary Right of Way Plan Tasks

For a complete listing of tasks of which should be completed during the development of the Preliminary Right of Way Plan, consult the [SAFE Task List](#).

Refer to the **Office of Real Estate, Right-of-Way Manual, [Section 3100 Right of Way Plan Manual](#)**, for details regarding Preliminary Right of Way Plan development.

1406.6.3 Preliminary Right of Way Plan Review Submission

The following documents are required as part of the **Preliminary Right of Way Plan Review Submission**:

- Right of Way Review Checklist (See [Appendix H](#) of the **R/W Plan Manual**)
- Field Review Checklist (See Section 3110.3 and [Appendix I](#) of the **R/W Plan Manual**).
- Right of Way Description Checklist (See [Appendix J](#) of the **R/W Plan Manual**)

In addition to the Preliminary Right of Way Review Submission, a Conceptual Right of Way Review Submission may be requested by the District Real Estate Administrator as part of the project's Scope of Services document. The Conceptual Right of Way Review Submission will typically apply to large, complex projects, and should not be considered a substitute for the Preliminary Right of Way Review Submission.

The **Preliminary Right of Way Plan Review Submission** must be reviewed and **accepted** by the District.

For a complete list of Preliminary Right of Way Plan tasks, refer to the **Right of Way Plan Manual** or ODOT's [Scope and Fee \(SAFE\) System](#) task list. Contact the [Office of Real Estate](#) with questions.

1406.7 Stage 2 Detailed Design

1406.7.1 General

Stage 2 Detailed Design is part of the Environmental Engineering (EE) phase of the Project Development Process (PDP). Its primary purpose is to detail and draft the ideas and concepts set forth in the Preliminary Engineering and the Stage 1 Detailed Design. Stage 2 Detailed Design is typically where the majority of the design detailing and plan preparation takes place. At the end of the **Stage 2 Detailed Design**, all design issues of any significance should be resolved.

For more information on when **Stage 2 Detailed Design** occurs, see the [Project Development Process Manual \(PDP\)](#).

1406.7.2 Stage 2 Detailed Design Activities

The following is a list of typical **Stage 2 Detailed Design** activities:

- Add pavement elevations to Interchange Details. Develop grading plans.
- For concrete pavements, determine locations of longitudinal and transverse joints. Show the locations of these joints on the Intersection Details and Interchange Details.
- Prepare reinforcing details for full height culvert walls.
- Submit designs for precast reinforced concrete box culverts, three-sided flat-topped culverts and precast reinforced concrete arch sections where the usual maximum height of cover is

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- exceeded.
- Complete retaining wall detail design.
- Update Signing Plan. Re-evaluate guardrail length of need if use to protect major guide signs.
- Lighting analysis to determine pole spacing and locations. Voltage drop calculations.
- Determine the disposition of all miscellaneous items (e.g., mailboxes).
- Prepare plan for fencing at Right of Way lines.
- Add proposed Right of Way lines to Plan and Profile, and cross section sheets.
- Evaluate railroad/railway responses to Stage 1 plans. Revise plans to incorporate responses, if warranted. Send copy of Stage 2 Detailed Design plans to the railroad/railway company.
- Obtain approval from the Design Aesthetics Committee for all aesthetic items (e.g., concrete textures, landscape design, color).
- Evaluate and incorporate recommendations from Detailed Design Phase Value Engineering Study.
- Prepare plans for Constructability Review.
- Update the construction cost estimate.

A complete list of **Stage 2 Detailed Design** activities can be found in ODOT's [Scope and Fee \(SAFe\)](#) System task list.

1406.7.3 Stage 2 Detailed Design Review Submission

Although each project is unique, there are certain key elements which are a part of the **Stage 2 Detailed Design Review Submission**. Following are items which are typically included as part of Stage 2:

- Title Sheet per **Section 1302**; except Engineer's seal, Supplemental Specifications, Special Provisions, Standard Construction Drawings, and Earth Disturbed Areas.
- Schematic Plan sheet per **Section 1303**
- Typical Sections sheets per **Section 1304**
- General Note sheet listing utility companies as per **Appendix B, Note G102**
- Maintenance of Traffic phasing plans, including sequence of operations
- Detour map, notes, and County Engineer Approval
- Plan and Profile sheets as per **Section 1309**. Estimated quantities are not required.
- Cross Sections sheets, as per **Section 1310**, except earthwork and seeding calculations.
- Intersection Details sheets
- Interchange Detail sheets
- Drive Detail sheets showing plan and profile information
- Culvert Detail sheets as per **Section 1312.2**, except estimated quantities.
- Headwall/wingwall details for those not covered by the Standard Construction Drawings
- Channel section and relocation detail sheets
- Storm Sewer Profile sheets
- Water work and sanitary sewer plans, if not covered by the Plan and Profile sheets
- Pavement Marking and Signing Plan sheets as per the **Traffic Engineering Manual**
- Revised Systems Engineering Analysis for Intelligent Transportation System (ITS) projects
- Signal Plan sheets as per the **Traffic Engineering Manual**
- Lighting plan as per the **Traffic Engineering Manual**; except estimated quantities
- Landscaping Plan; except estimated quantities
- Noise wall details
- Bridge plans as per the **Bridge Design Manual**; except estimated quantities and reinforcing steel tables.
- Approval of aesthetic details

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- Retaining Wall detail sheets
- Fencing Plan
- Detailed Right of Way Plan Sheets from the Preliminary Right of Way Review
- Copies of utility company correspondence
- Copies of railroad/railway company correspondence
- Disposition of Detailed Design Phase Value Engineering recommendations
- Plans for Second Constructability Review
- Cost estimate for construction and right of way acquisition. The District Utility Coordinator to provide revised utility reimbursement cost estimate, if necessary. Explain any significant increase or decrease in estimated cost from previous estimates.
- Disposition of Stage 1 Review comments
- Geotechnical Plan Review Certification

The **Stage 2 Detailed Design** must be reviewed and **accepted** by the District.

1406.8 Final Right of Way Plan

1406.8.1 General

Final Right of Way plans are part of the **Final Engineering/ROW (FE)** phase of the Project Development Process (PDP). They incorporate comments generated during the Preliminary Right of Way Plan development, and any Stage 2 Detailed Design comments which affect the right of way plan, legal descriptions, and calculations. Stage 2 design issues affecting right of way must be resolved prior to submission of the Final Right of Way plans.

Section 3110.4 of the **Right of Way Plan Manual** contains more information on the **Final Right of Way Plan** submission.

1406.8.2 Final Right of Way Plan Review Submission

The Final Right of Way Submission should include:

- Legal descriptions.
- Closure calculations.
- Revisions from the Stage 2 Detailed Design Review.
- Disposition of Preliminary Right of Way Review comments.

Refer to ODOT's **Scope and Fee (SAFe) System** task list for a complete list.

Also, as part of this submission, the Right-of-Way designer and/or reviewer are required to perform a field review. The Field Review Checklist (**Appendix I**) is to be completed prior to the preliminary right-of-way review submission, and then **again** within 15 working days of submitting the Final Right of Way Plans. See **Section 3110.3** of the **Right-of-Way Plan Manual** for more information on the **Field Review Process**.

The **Final Right-of-Way Plan Review Submission** must be reviewed and **accepted** by the District.

1406.9 Stage 3 Detailed Design

1406.9.1 General

The **Stage 3 Detailed Design** should complete the design and detailing of the project. These plans

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must contain all details and quantities required to bid and construct the proposed work. Plans should be numbered and submitted as a complete set and organized as per **Section 1301.1**.

Stage 3 Detailed Design is part of the Final Engineering/ROW (FE) phase of the Project Development Process (PDP). A **Stage 3 Detailed Design** review is required for all projects; except Limited Review and Design-Build Projects.

It is recommended that a second **Stage 3 Detailed Design** review be conducted if more than two years have elapsed since the first Stage 3 Detailed Design Review, and the Final Plan Package has not been submitted to Central Office. The purpose of this review is to ensure that the plans reflect current field conditions, as well as all current design standards, policies, and specifications.

1406.9.2 Stage 3 Detailed Design Activities

The preparation of a Stage 3 Detailed Design typically involves the following activities:

- Preparation of Simplified Plans
- Preparation of underdrain bends and branches list.
- Preparation of the Project Site Plan.
- Determination of all estimated quantities plan (i.e., pavement, drainage, earthwork, signing)
- Determination of appropriate notes (i.e., general notes, MOT notes, traffic control notes)
- Determination of any participation splits
- Preparation of the General Summary and Bridge Estimated Quantity sheets.
- Finalization of the Systems Engineering Analysis for Intelligent Transportation System (ITS) projects.
- Completion of traffic signal plans
- Completion of signing plans.
- Submission of plans to involved railroad/railway companies for approvals. Railroad agreement must be obtained prior to submission of Final Plan Package to Central Office.
- Preparation of **FAA Form 7460-1** for Airway/Highway Clearance.
- Revision of construction utility reimbursement cost estimates.

Refer to **ODOT's Scope and Fee (SAFe)** task list for a complete list of the activities required to complete the Stage 3 Detailed Design.

1406.9.3 Stage 3 Detailed Design Review Submission

Although not an all-inclusive list, the Stage 3 Detailed Design Review Submission should include:

- A complete set of construction and Right of Way plans
- **Acceptance** of non-standard plan notes.
- Systems Engineering Analysis for Intelligent Transportation System (ITS) projects
- Railroad Agreement
- Completed **FAA Form 7460-1** per **Section 1407.1.7**
- **ODNR** plan approvals
- Construction and utility reimbursement cost estimates
- Disposition of Constructability Review comments
- Disposition of Stage 2 Detailed Design Review comments

The **Stage 3 Detailed Design Review Submission** must be reviewed and **accepted** by the District.

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Refer to [ODOT's Scope and Fee \(SAFe\) System](#) task list for a complete list of the activities required to complete the **Stage 3 Detailed Design**.

1406.10 Final Plan Package

Submission of the Final Plan Package is part of the **Final Engineering/ROW (FE)** phase of the **Project Development Process (PDP)**. ODOT has established uniform procedures and criteria for the submission of plan packages to the **Office of Estimating**. The Final Plan Package for a project is to be submitted in accordance with the schedule prepared by Central Office and the Districts. It must include documentation that confirms the project is eligible and ready to be advertised for bids.

The project's plan final plan package contains all files and information relevant to the project, such as the:

- [Design Estimate](#)
- [Proposal Note List](#)
- [Construction Plans](#)
- [Electronic files](#) (i.e., CADD files, Excel files, alignment files, etc.)
For more information, see the [ODOT Guidelines for Electronic Deliverables](#) document located on the [Office of CADD & Mapping Services'](#) website.
- [Estimated Quantities Form](#)

Project Managers are required to create and submit plan package documentation in electronic format, as a single PDF. All ODOT-let projects shall be submitted to **Project Coordination** via the ODOT Plan Package Submittal internal SharePoint site located here:

<http://portal.dot.state.oh.us/Divisions/Planning/estimating/PlanSubmittal/default.aspx>

The submission of completed plans to the District from a consultant should follow **Section 1505** of this manual.

1407 Miscellaneous Studies

1407.1 Airway/Highway Clearance Analysis

1407.1.1 Introduction

The purpose of an Airway/Highway Clearance Analysis is to determine if a proposed project will encroach into the theoretical approach, or traverse surfaces, of an airport or heliport. When a project is identified as being within 20,000 feet of a public-use or military airport, or heliport, an analysis must be performed to determine if **FAA** notification is required. The initial determination whether or not a project is within the 20,000-foot distance is to be made at the time of programming, and it should be so noted on the programming forms and in ODOT's project management system.

The Airway/Highway Clearance Analysis procedures contained in this manual are based on the "**Federal Aviation Regulations, Part 77 - Objects Affecting Navigable Airspace.**" Information on the location of airports and lengths of runways may be obtained from the "**Ohio Airport Directory,**" as published by the **Ohio Department of Transportation, Office of Aviation.**

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1407.1.2 Notification Surfaces

The following conditions need to be examined to determine if notification is required.

- Any construction or alterations of more than 200 feet in height above ground level.
- Any construction or alteration of greater height than an imaginary surface extending outward and upward at the following slopes:
 - 100:1, for horizontal distance of 20,000 feet from the nearest point of the nearest runway, for any airport with at least one runway with a length of more than 3,200 feet, excluding heliports.
 - 50:1, for a horizontal distance of 10,000 feet from the nearest point of the nearest runway, for any airport where the length of the longest runway does not exceed 3,200 feet, excluding heliports.
 - 25:1, for a horizontal distance of 5,000 feet from the nearest point of the nearest landing and takeoff area, for a heliport.

See **Figure 1407-1** for a graphical depiction of these surfaces.

1407.1.3 Traverse Way Adjustments

In determining whether any roadway or other traverse way (e.g., railroad, waterway, bikeway, etc.) will violate the limits described in the previous section, it is necessary to include an additional upward height above the traverse way elevation for vehicles that might travel on the facility. The adjustments are as follows:

- 17 feet for Interstate highways, other freeways, and expressways
- 15 feet for all other public roadways and commercial driveways
- 10 feet for all private roads and driveways
- 23 feet for railroads
- an amount equal to the height of the highest mobile object that would normally traverse the facility, for a waterway or for any other traverse way not previously mentioned

This additional height must be considered to apply over the full width of the traveled portion and the shoulders of the roadway. **Figure 1407-1** includes examples of several traverse way adjustments.

1407.1.4 Exceptions to Notification Requirements

FAA notification is not required where one or more of the following applies to the object penetrating the notification surface:

- the object is shielded by existing structures of a permanent and substantial character or by natural terrain or topographic features, of equal or greater height
- the object is located in the congested area of a city, town, or settlement, where it is evident beyond all reasonable doubt that there could be no adverse effect on safe air navigation
- the object is an antenna of 20 feet or less in height, except one that would increase the height of another antenna structure

Figure 1407-2 includes examples of locations where FAA notification is, and is not, required.

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1407.1.5 Temporary Structures and Construction Equipment

It is possible that a project located within 20,000 feet of an airport will not require **FAA** notification for permanent features but will require notification for temporary structures or construction equipment. **Figure 1407-3** contains height allowances for equipment or structures associated with various types of construction. These allowances should be used to determine if the notification surface will be penetrated. For short projects (100 feet or less in length), any applicable heights should be considered to apply over the entire length of the project.

Judgment must be used when applying these heights to longer projects. For example, the allowance for equipment used to construct a bridge would only be needed in the vicinity of the bridge; however, the allowance for earth moving and paving equipment should be applied over the entire length. When any doubt exists, consult the **Office of Aviation**.

1407.1.6 Controlled Areas

Figure 1407-4 displays cross-sectional and profile views of imaginary surfaces that exist above the notification surface. **Figure 1407-5** depicts an area at the end of a runway called the Runway Protection Zone (RPZ). **Figure 1407-6** contains dimensions defining the sizes of RPZ's for different facilities. Projects should be designed so that these controlled areas are not penetrated by any features, as the **FAA** will not normally permit violations.

1407.1.7 FAA Notification/Clearance Procedures

Whenever a project is located within 20,000 feet of a public-use or military airport or heliport, an Airway/Highway Clearance Analysis must be performed. Documentation which provides the information contained in **Figure 1407-7** must be supplied. The District will use this information to complete **FAA Form 7460-1**. The **FAA** requires the use of English units.

The District will submit the following information to the **FAA** for approval:

- Two completed **FAA Form 7460-1's**. One form is for the proposed project and the other form is for the construction equipment and/or temporary structures.
 - Latitude, longitude (NAD), and elevation (above mean sea level) of the following points:
 - For short bridge projects, 100 feet or less in length:
 - i. Highest point of the superstructure of the bridge.
 - For all other projects:
 - i. Beginning of the project
 - ii. End of the project
 - iii. Highest point of the project
 - iv. Closest point to the runway
 - v. Any other points that may be important to the study (e.g., various high points throughout the project that may penetrate the imaginary surface)
 - vi. Each light tower or signal pole. In addition, include: structure number, latitude, longitude, ground elevation, structure height and overall height
 - vii. Highest point of the superstructure of each bridge
- Accuracy of points should be within 50 feet horizontally and 20 feet vertically.
- A **USGS** map of the project location relative to the airport showing a reference for each point listed above.

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Instructions on how to file the 7460-1 form with the FAA can be found on the Office of Aviation's website at:

<http://www.dot.state.oh.us/Divisions/Operations/Aviation/Pages/FAAandStateNotificationRequirements.aspx>

When approval (or comments) is received from the **FAA**, the District Project Engineer will retain the original correspondence and distribute copies to the **Office of Aviation** and the **FHWA** (for federal oversight projects only). Submit FAA approvals to the **Office of Aviation** electronically at the following web address:

Ohio.Airport.Protection@dot.state.oh.us

FAA comments will generally relate to certification of the coordinates submitted or the submission of **Form 7460-2, Supplemental Notice**. The **FAA** may also request that a light pole, or other similarly tall structure, be visibly marked or possibly reduced in height.

Approvals are valid for a period of eighteen (18) months. The District will monitor project status (sale date) relative to the approval expiration date and submit a request for extension to the **FAA** at least two (2) weeks prior to the expiration date.

When construction equipment is expected to penetrate the notification surface of a public-use or military airport or heliport, note **G118A** should be added to the plans. When construction equipment is not expected to penetrate the notification surface, but the project is within the influence area of a public-use or military airport or heliport, note **G118B** should be used.

1407.1.8 Private Facilities

An Airway/Highway Clearance Analysis is required for private airports and heliports. The notification surfaces detailed in [Section 1407.1.2 - Notification Surfaces](#) shall apply to both public and private facilities. If there are any penetrations into the notification surfaces that impact a private facility, coordination with the private owner, and the Office of Aviation, shall be made and note G118C should be added to the plans. Coordination with the FAA is not required.

1407.2 Retaining Wall Justification

A **Retaining Wall Justification** compares the impacts and costs (both right-of-way and construction) of the project with and without retaining walls. Estimated right-of-way costs are to be provided or verified by the **Office of Real Estate**.

A **Retaining Wall Justification** should include:

- Plan sheets showing wall and no-wall alternatives, including:
 - Approximate construction limits
 - Right of Way parcels affected
- Cross sections showing wall and no-wall alternatives.
- Economic analysis comparing right of way and construction costs, with and without the wall.
- Discussion of environmental impacts with and without the wall (optional).

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1407.3 Service Road Justification Study

Service roads (sometimes called access or frontage roads) are used to: reduce the number of existing access points, connect roads cut off by highway relocation, and to provide access to parcels that would otherwise be landlocked by a highway relocation. The decision to use a service road to decrease the number of existing access points is usually made for safety or capacity reasons, although in some cases it could be based on economics. Using a service road to connect roads cut off by a relocation is done primarily to provide needed traffic circulation. Providing access via a service road to otherwise landlocked parcels is primarily an economic decision.

Maintenance of service roads by the State is not desirable because, in many cases, these facilities are not readily accessible from a state highway. It is therefore necessary that a statement of acceptance of routine maintenance by a local government agency be obtained.

A **Service Road Study Form** (see **Appendix D**) must be completed. In preparing the analysis, maintenance costs related to the service road must be considered. Estimated right of way costs are to be provided or verified by the **Office of Real Estate**. For information and guidance on preparing the **Service Road Study Form** contact the **Office of Roadway Engineering**.

1407.4 Pedestrian Overpass Justification

A **Pedestrian Overpass Justification** compares the impacts and costs of a project with and without a pedestrian overpass. A statement of acceptance by a local government agency assuming responsibility for all routine maintenance of the structure and approaches must be obtained. Routine maintenance includes: clearing debris from the deck, sweeping, snow and ice removal, minor wearing surface patching, clearing bridge drainage systems, marking decks for traffic control, minor and emergency repairs to railing and appurtenances, emergency patching of deck and maintenance of traffic signal and lighting systems, including the supply of electrical power. For information on **Pedestrian Overpasses**, refer to **Location and Design Manual, Volume 1, Section 306.5**.

1407.5 Value Engineering (VE) Studies

Value Engineering (VE) is a systematic analysis by a multi-discipline team which identifies the functions of a project, establishes the worth of that function, generates alternatives through the use of creative thinking, and identifies ways to provide the needed functions at the lowest overall cost, without sacrificing safety, quality, and the environmental attributes of the project.

The Department requires that **Value Engineering studies** be performed on federally funded projects meeting the following criteria:

- All projects on the federal-aid system with an estimated total cost in excess of fifty (50) million dollars (including design, right of way, and construction)
- All bridge projects located on the federal-aid system with an estimated cost in excess of forty (40) million dollars (including design, right of way, and construction)
- Any other project selected by FHWA

Appropriate timing of **VE studies** will ensure that there is sufficient information to analyze during the Value Engineering Session and that accepted recommendations can be successfully implemented without impeding the overall project development schedule.

The criteria used to determine if a project qualifies for Value Engineering can be found in ODOT's **Standard Procedure No. 414-001(SP), Design Value Engineering Standard Procedures**. The **Design Value Engineering Policy** can be found in [Policy No. 21-006\(P\)](#).

SECTION 1400 Project Development

It is the District's responsibility to review projects currently programmed in the Planning, Preliminary Engineering, and/or Final Engineering/ROW phase to determine if a project qualifies for **Value Engineering**. The District Value Engineering Coordinator is also responsible for monitoring project schedules and contacting the **Office of Roadway Engineering Value Engineering Coordinator (COVEC)** to schedule a **Value Engineering Study**.

The COVEC oversees ODOT's **VE** program, provides assistance to the Districts, ensures that all **VE** recommendations are fully evaluated, and all accepted recommendations of the **VE** team are implemented.

Since each project is unique, there may be instances where multiple value engineering studies may be required. Typically, Path 3, and some Path 4, projects that qualify for **Value Engineering** require only one **Value Engineering Study** to be performed. More complex Path 4 and Path 5 projects, with extensive impacts, will likely require two Value Engineering studies.

Contact the **Office of Roadway Engineering** for more information on **Value Engineering**.

1407.6 Constructability Review

The intent of a **Constructability Review** is to check the plans for potential construction strategies, techniques and logistical issues. It is an evaluation of the project plans, sometimes supplemented by a site visit conducted by an individual familiar with construction techniques, to evaluate construction means and methods. The Constructability Review also checks construction durations, and alternative designs. It identifies labor and material availability, access for large equipment, project phasing, and the conceptual maintenance of traffic.

The Project Manager will determine if a **Constructability Review** will be conducted concurrent with the Preliminary Engineering Phase.

To ensure an independent evaluation, constructability reviews should not be conducted by the design consultant who prepared the plans. Designers should routinely consider constructability issues during the normal course of project development.

SECTION 1400 Review Submissions

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SECTION 1400 Review Submissions

List of Figures

<u>Figure</u>	<u>Subject</u>
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1402-1	Design Information Sources
1402-8	Federal Oversight Determination Process
1404-1	Relationship of Traverse Ways to the Imaginary Notification Surface
1404-2	Examples of Factors Affecting the Imaginary Surface
1404-3	Maximum Operating Height of Construction Equipment
1404-4	Cross-Sectional and Profile Views of Imaginary Surfaces
1404-5	Runway Protection Zone
1404-6	Dimensions for Runway Protection Zone
1404-7	Sample Letter of Airway/Highway Clearance Analysis

SECTION 1400 Review Submissions

List of Figures

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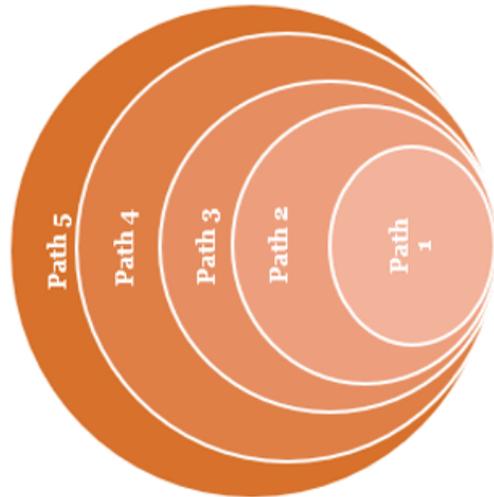
PROJECT DEVELOPMENT PROCESS PROJECT PHASES AND PATHS	1402-1
	REFERENCE SECTION 1402

ODOT's Project Development Process (PDP) – Phased Approach



All ODOT projects must advance through the five sequential phases shown above.

PDP Project Paths



Depending on the size, complexity, and/or potential impact to the environment, all ODOT transportation projects are categorized as following one of five categories (Path1 - Path 5). Consult the PDP Manual or contact the Office of Environmental Services directly with questions.

A project's path identifies:

- Recommended level of analysis
- Amount of stakeholder involvement
- Activities performed during each phase

The selection of the appropriate project path is based on the anticipated level of project complexity. The higher the path level, the more complex the project.

More information on project paths and phases can be found in ODOT's Project Development Process (PDP) manual. ODOT's Scope and Fee (SAFe) System provides a listing of tasks associated with each phase of project development. Contact the Office of Consultant Services with questions regarding the SAFe System.

DESIGN INFORMATION SOURCES	1405-1
	REFERENCE SECTION 1405.1

OFFICE/ SPECIALTY AREA	CENTRAL OFFICE DESIGN AREA OF EXPERTISE	DESIGN MANUALS, STANDARD DRAWINGS AND POLICIES
Alternative Project Delivery	<ul style="list-style-type: none"> Design Build Value Based Contracting 	<ul style="list-style-type: none"> Design-Build Manual ODOT Design-Build Value-based Selection Policy (#27-022 (P)) Implementation and Administration of Warranty Provisions Policy (#27-015(P)) Innovative Contracting Policy (#27-013(P))
Aviation	<ul style="list-style-type: none"> Airports and Heliports Airway/Highway Clearance Analysis Flight Operations Unmanned Aerial Systems (UAS) 	<ul style="list-style-type: none"> Airspace Protection Act Federal Aviation Regulations, Part 77-Safe, Efficient Use, and Preservation of the Navigable Airspace
CADD and Mapping Services	<ul style="list-style-type: none"> Aerial mapping Lidar Ground surveys CADD (MicroStation and GEOPAK) GIS 	<ul style="list-style-type: none"> Survey and Mapping Specifications Location and Design Manual, Volume 3 Sample Plan Sheets CADD Engineering Standards Manual ODOT Guidelines for Electronic Design Deliverables
Construction Administration	<ul style="list-style-type: none"> Specification Development Supplemental Specifications Proposal Notes Change Orders Warranties LPA Construction Contract Administration 	<ul style="list-style-type: none"> Construction and Material Specifications Supplemental Specifications Proposal Notes ODOT Design Build Value-based Selection Policy (#27-022(P)) Innovative Contracting Policy (#27-013(P)) Manual of Procedures
Environmental Services	<ul style="list-style-type: none"> Ecological Resources and Permits Coast Guard Permits Cultural Resources Environmental Policy & NEPA Noise walls Aesthetic Design Environmental Commitments Environmental Site Assessment Project Development Process 	<ul style="list-style-type: none"> Cultural Resources Manual Ecological Manual Regulated Materials Review Manual ODOT OES Underserved Populations Guidance ODOT NEPA Assignment Environmental Commitments Guidance ODOT Floodplain Management Guidelines Noise Manual

DESIGN INFORMATION SOURCES	1405-1
	REFERENCE SECTION 1405.1

OFFICE/ SPECIALTY AREA	CENTRAL OFFICE DESIGN AREA OF EXPERTISE	DESIGN MANUALS, STANDARD DRAWINGS AND POLICIES
		<ul style="list-style-type: none"> • ODOT Aesthetic Design Guidelines • Project Development Process (PDP) Manual • Project-Level Air Quality Manual 2015 • ODOT Underserved Populations Guidance • Section 4(f) Manual • Waterway Permits Manual
Estimating	<ul style="list-style-type: none"> • Application of design related proposal notes • Historical cost data • Items numbers and Item Extensions • Bid analysis and review • Construction cost estimating • General Summaries (GenSum) • Project Coordination 	<ul style="list-style-type: none"> • Item Master • Summary of Contracts Awarded
Geotechnical Engineering	<ul style="list-style-type: none"> • Roadway and Geohazards • Foundations and Retaining Walls • Field Explorations 	<ul style="list-style-type: none"> • Manual for Abandoned Underground Mine Inventory and Risk Assessment (AUMIRA) • Rock Slope Design Guide • Specifications for Geotechnical Explorations (SGE) • Geotechnical Engineering Design Checklists • Geotechnical Bulletins • Manual for Rockfall Inventory • Manual for Landslide Inventory
Hydraulic Engineering	<ul style="list-style-type: none"> • Roadway hydraulics (storm sewers, culverts) • Post-Construction Storm Water BMP's • Channels • Floodplain Management • Storm Water Management Program (SWMP) 	<ul style="list-style-type: none"> • Hydraulic Standard Construction Drawings • Culvert Management Manual • Location and Design Manual, Volume 2 - Drainage Design • MS4 Storm Water Outfall Inventory Manual

DESIGN INFORMATION SOURCES	1405-1
	REFERENCE SECTION 1405.1

OFFICE/ SPECIALTY AREA	CENTRAL OFFICE DESIGN AREA OF EXPERTISE	DESIGN MANUALS, STANDARD DRAWINGS AND POLICIES
<u>Pavement Engineering</u>	<ul style="list-style-type: none"> • Pavement Design • Subsurface drainage (underdrains, aggregate drains) 	<ul style="list-style-type: none"> • <u>Pavement Design Manual</u> • <u>Pavement Standard Construction Drawings</u> • <u>Usage Guidelines Trackless Tack</u>
<u>Policy</u>	<ul style="list-style-type: none"> • Policy 	<ul style="list-style-type: none"> • <u>Policies and Procedures</u>
<u>Program Management</u>	<ul style="list-style-type: none"> • Traffic Data • Crash Data & Analysis • <u>Major Programs</u> • <u>Highway Safety</u> • Capital Reporting 	<ul style="list-style-type: none"> • <u>ODOT Highway Functional Classification System Concepts, Procedures and Instructions</u> • <u>Safety Study Guidelines</u> • <u>Highway Safety Improvement Program Procedures Manual</u>
<u>Rail Development Commission</u>	<ul style="list-style-type: none"> • Railroad coordination • Railroad agreements 	<ul style="list-style-type: none"> • Design manuals published by individual railroad/railway companies
<u>Real Estate</u>	<ul style="list-style-type: none"> • Acquisition • Certification • Utilities • Relocation • • Appraisal • Property Management 	<ul style="list-style-type: none"> • <u>Right of Way Plan Manual</u>
<u>Roadway Engineering</u>	<ul style="list-style-type: none"> • Americans with Disabilities Act (ADA) • Crash Standards • Design Exceptions • Geometrics (alignments, profiles, typical sections, drives, slopes, guardrail, barrier wall) • Landscaping • Lighting • Maintenance of Traffic • Preliminary Design • Signal Warrants • Signing • Studies and Access Management • Traffic Control 	<ul style="list-style-type: none"> • Appropriate Design Criteria Guide • <u>Location and Design Manual, Volume 1 - Roadway Design</u> • <u>Standard Construction Drawings</u> • <u>Plan Insert Sheets</u> (Roadway, Traffic) • Curb Ramps Required in Resurfacing Plans (<u>Policy #21-003(P)</u>) • Traffic Management in Work Zones (<u>Policy #21-008(P)</u>) (Standard Procedure # 123-001(SP)) • Design Value Engineering Standard Procedure (<u>414-001(SP)</u>) • <u>Ohio Manual of Uniform Traffic Control Devices (OMUTCD)</u>

DESIGN INFORMATION SOURCES	1405-1
	REFERENCE SECTION 1405.1

OFFICE/ SPECIALTY AREA	CENTRAL OFFICE DESIGN AREA OF EXPERTISE	DESIGN MANUALS, STANDARD DRAWINGS AND POLICIES
	<ul style="list-style-type: none"> • Traffic Sign Models (Synchro) • Value Engineering • Work Zones 	<ul style="list-style-type: none"> • Sign Design and Markings Manual (SDMM) • Temporary Traffic Control Manual (TTCM) • Traffic Engineering Manual (TEM)
Statewide Planning & Research	<ul style="list-style-type: none"> • Access Ohio (Statewide Transportation Plan) • Certified Traffic • Bike & Pedestrian Design • Metropolitan Planning • Modeling & Forecasting (Air Quality, Travel Demand Modeling) • State Planning & Research - Part 1 • Maritime & Freight program • Metropolitan Planning • Rural Planning • Air Quality 	<ul style="list-style-type: none"> • AASHTO Guide for the Development of Bicycle Facilities • Ohio Traffic Forecasting Manual • Transit Coding Manual • Bicycle and Pedestrian Resources for Engineers • ODOT Active Transportation Guide
Structural Engineering	<ul style="list-style-type: none"> • Bridges (structural design & detailing) • Retaining walls (structural design & detailing) • Mechanically Stabilized Earth (MSE) Retaining Walls • Headwalls 	<ul style="list-style-type: none"> • Bridge Design Manual 2007 • Bridge Design Manual 2004 • Standard Bridge Drawings • Plan Insert Sheets • Bridge Maintenance Manual • Bridge Inspection Manual
Systems Planning and Program Management	<ul style="list-style-type: none"> • Major Programs • Crash Analysis • GIS Analysis 	<ul style="list-style-type: none"> • ODOT Highway Functional Classification System Concepts, Procedures and Instructions • Functional Classification Maps
Technical Services	<ul style="list-style-type: none"> • Transportation Information Mapping System (TIMSO) • Asset Management • Traffic Monitoring • Infrastructure Transportation Management 	<ul style="list-style-type: none"> • County Maps • Digital Photo Log • Traffic Counts (Traffic Survey Reports & Maps) • Straight Line Diagrams

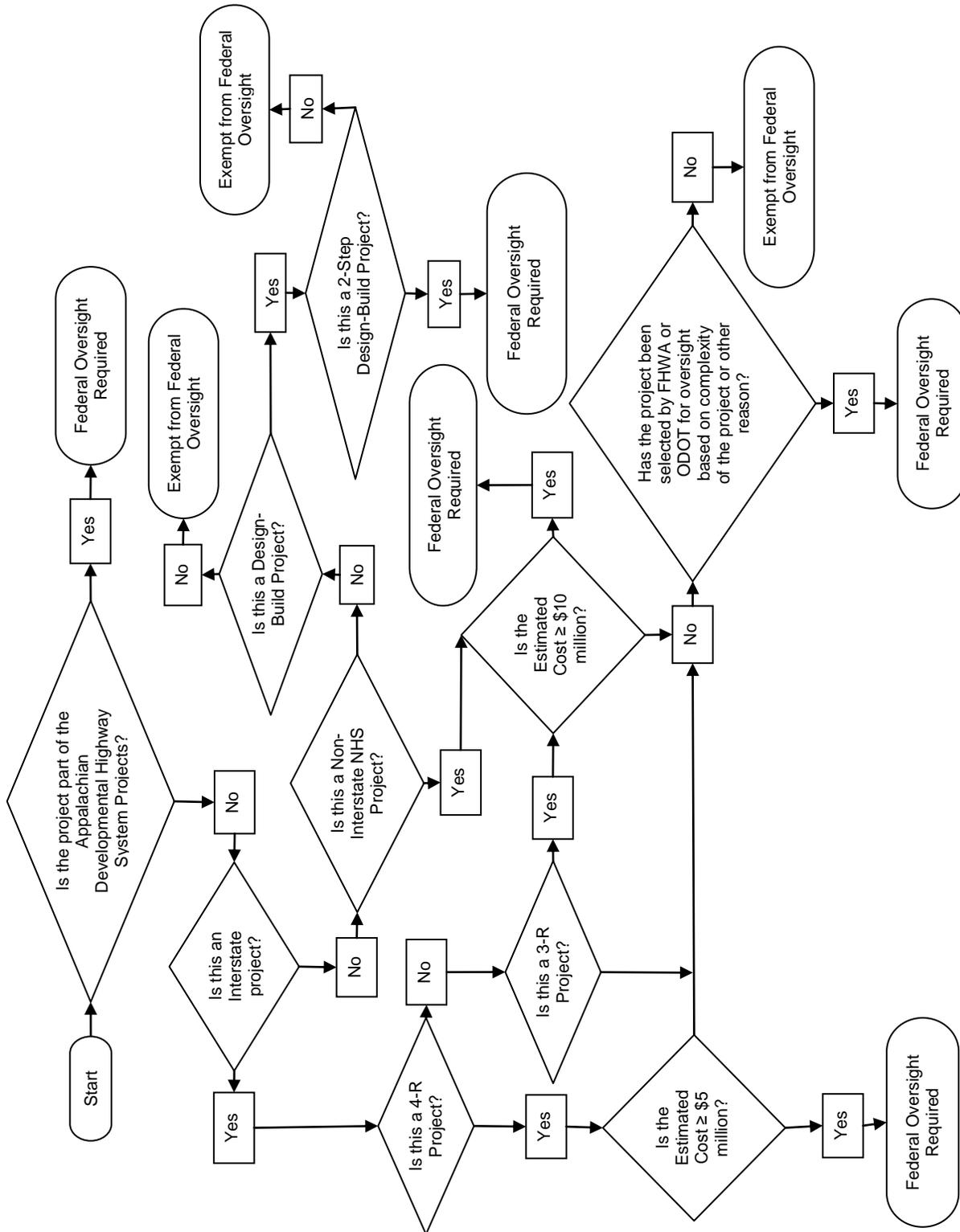
DESIGN INFORMATION SOURCES	1405-1
	REFERENCE SECTION 1405.1

OFFICE/ SPECIALTY AREA	CENTRAL OFFICE DESIGN AREA OF EXPERTISE	DESIGN MANUALS, STANDARD DRAWINGS AND POLICIES
Traffic Operations	<ul style="list-style-type: none"> • Incident Management Programs • Signals • Signing Programs • Intelligent Transportation Systems (ITS) 	<ul style="list-style-type: none"> • Signal Design Reference Packet • Office of Traffic Operations Handbook

NOTES:

- This is not an all-inclusive list of manuals published by each technical office. Only those manuals containing design standards and policies are shown.
- The **Policies and Procedures** website can be found at the following link:
<http://portal.dot.state.oh.us/Groups/policies/default.aspx>

<h2 style="margin: 0;">FEDERAL OVERSIGHT DETERMINATION PROCESS</h2>	<h1 style="margin: 0;">1405-2</h1>
	<p style="margin: 0;">REFERENCE SECTION 1405.2</p>

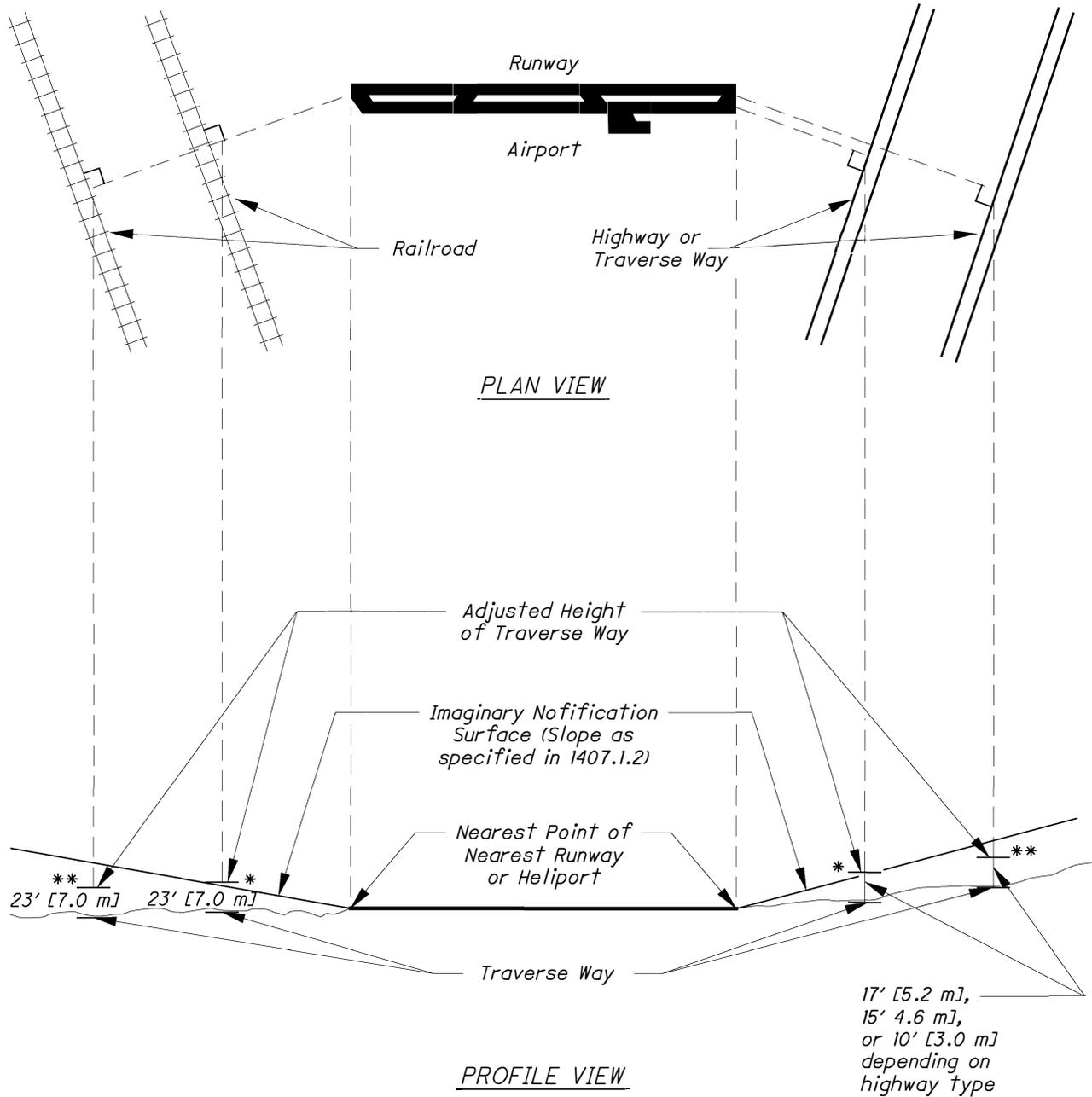


RELATIONSHIP OF TRAVERSE WAYS TO THE IMAGINARY NOTIFICATION SURFACE

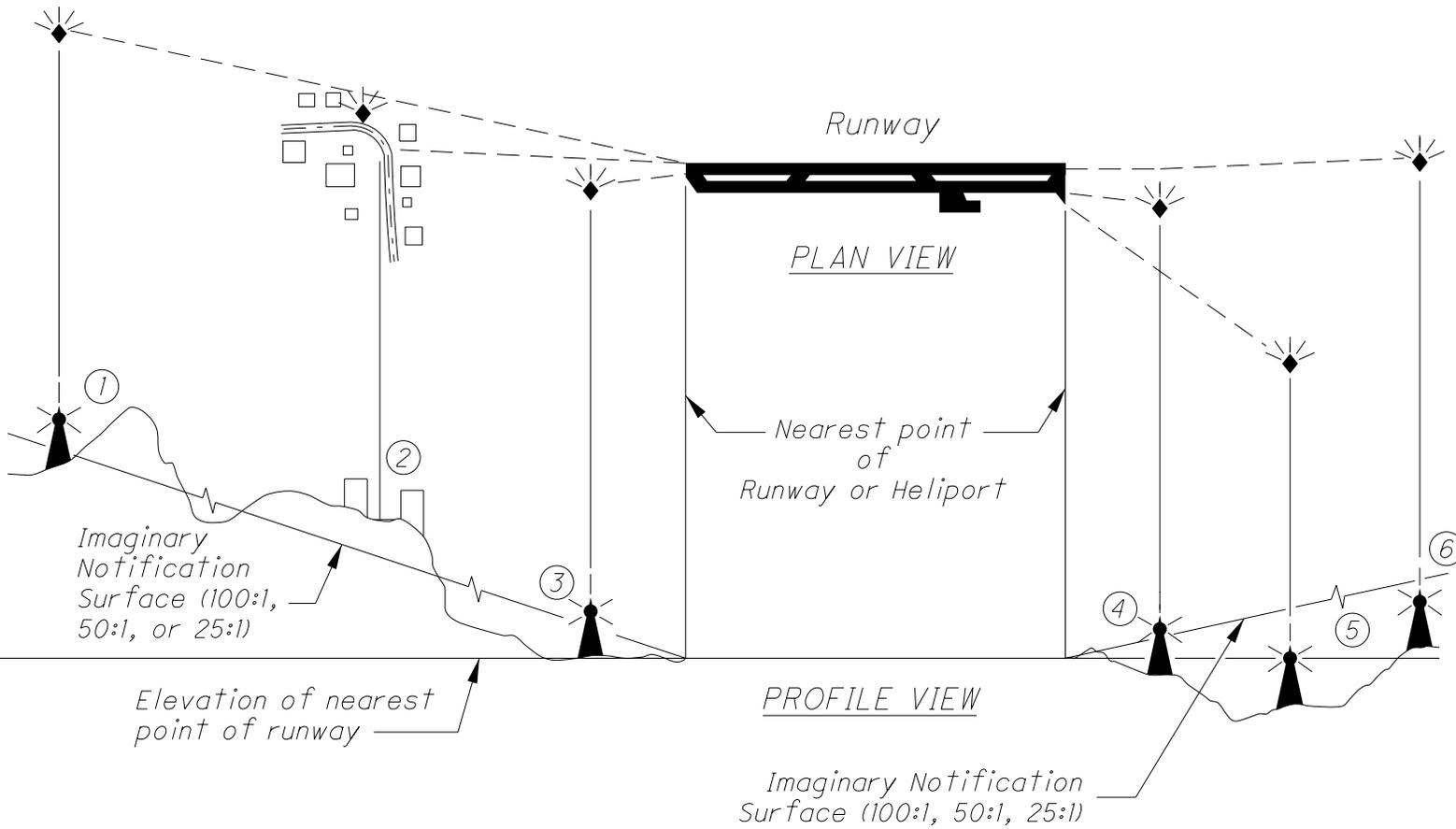
1407-1

REFERENCE SECTION

1407.1.3



* Notification required
** Notification not required



- ① Notification not required - object is shielded by natural topographic features
- ② Notification not required - roadway is shielded by existing structures of permanent and substantial character
- ③ Notification required - penetrates notification surface
- ④ Notification required - penetrates notification surface
- ⑤ Notification not required - below notification surface
- ⑥ Notification not required - below notification surface

 = Project Location
 = Project Location

**EXAMPLES OF FACTORS
AFFECTING THE
IMAGINARY SURFACE**

1407-2
REFERENCE SECTION
1407.1.4

MAXIMUM OPERATING HEIGHT OF CONSTRUCTION EQUIPMENT	1407-3
	REFERENCE SECTION 1407.1.5

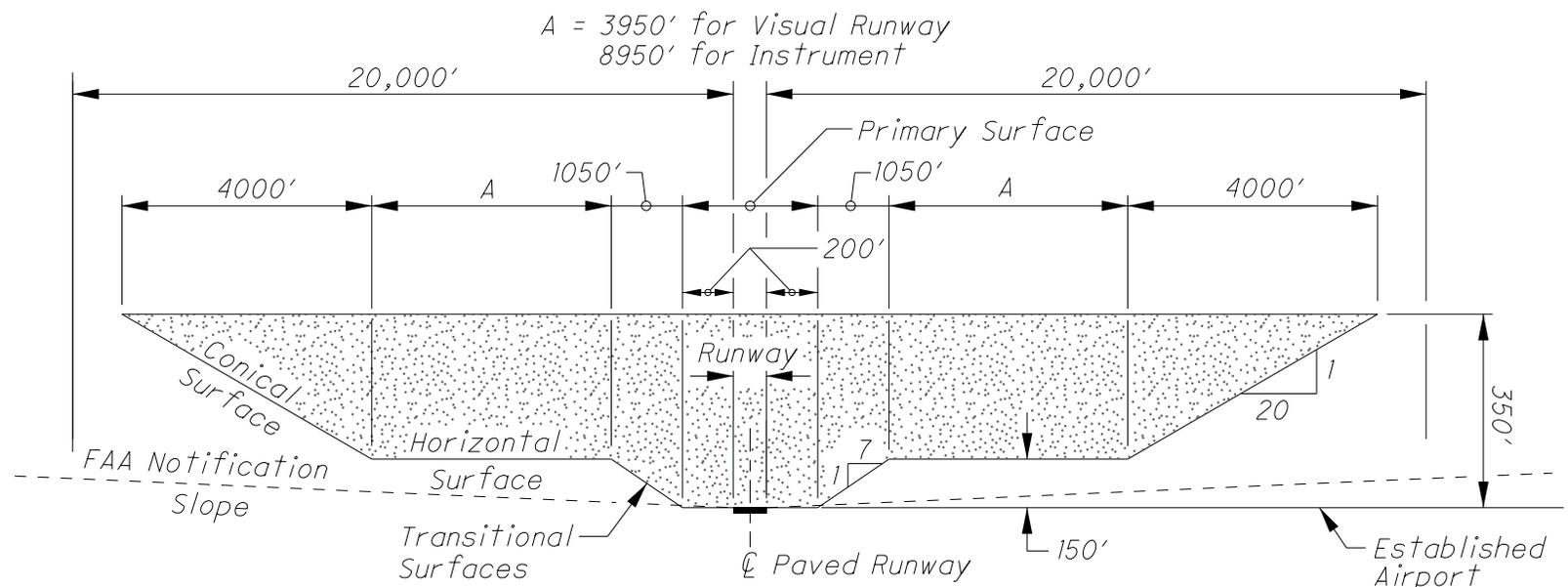
<u>WORK TYPE</u>	<u>HEIGHT</u>	<u>CONTROLLING CRITERIA</u>
Barrier Construction	50 Ft.	Crane
Bikeways	25 Ft,	Truck
Bridge Painting	Bridge Height + 10 Ft.	Containment Structure
Culverts	50 Ft.	Crane
Deck Overlays	25 Ft.	Truck
Earthwork	25 Ft.	Truck
Guardrail	25 Ft.	Auger
Highway Lighting	Pole Height	Pole Height
House Demolition	25 Ft.	Excavator
Large Bridges	100 Ft.	Crane
Mowing/Landscaping	10 Ft.	Mower
Noise Walls	25 Ft.	Crane
Pavement Marking	12 Ft.	Truck
Pavement Repair	25 Ft.	Raised Dump Truck
Pile Driving	50 Ft.	Crane
Resurfacing	25 Ft.	Raised Dump Truck
Rest Areas	50 Ft.	Crane
Slope Repair	25 Ft.	Excavator/Grader
Small Bridges	60 ft.	Crane
Traffic Signals	50 Ft.	Cherry Picker
Trash Collection	25 Ft.	Truck

The heights given are an average height for the specific types of projects. These heights should be adjusted, as necessary, for any project.

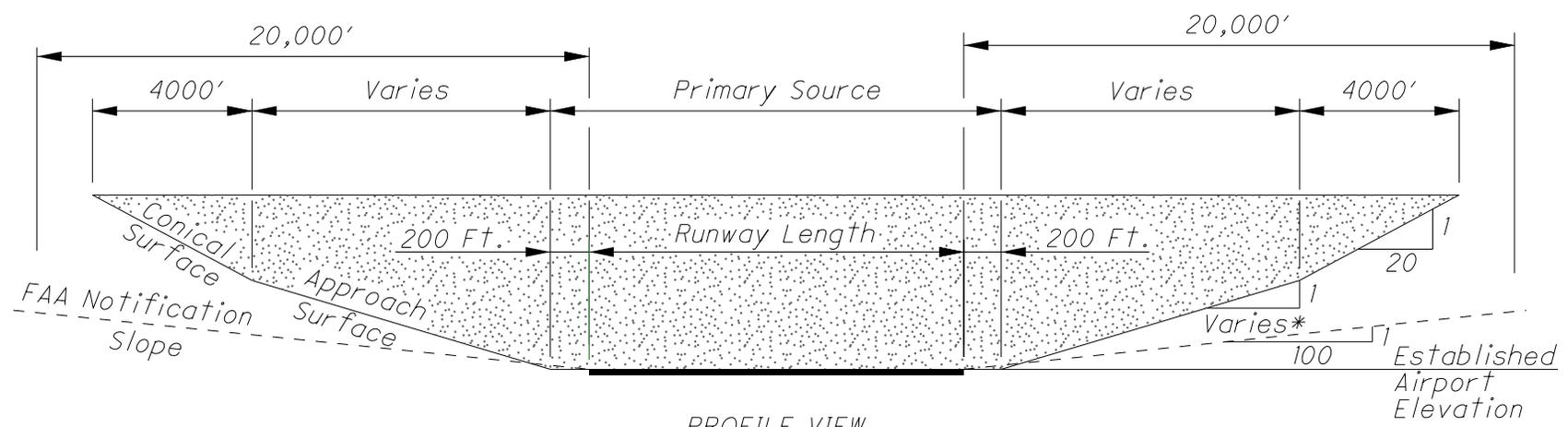
CROSS-SECTIONAL AND PROFILE VIEWS OF IMAGINARY SURFACES

1407 - 4
REFERENCE SECTION
1407.1.6

January 2013



CROSS SECTION VIEW
(Not to Scale)



PROFILE VIEW
(Not to Scale)

Obstruction zone,
Permit Required

- - NOTIFICATION SLOPES
- - OBSTRUCTION SLOPE

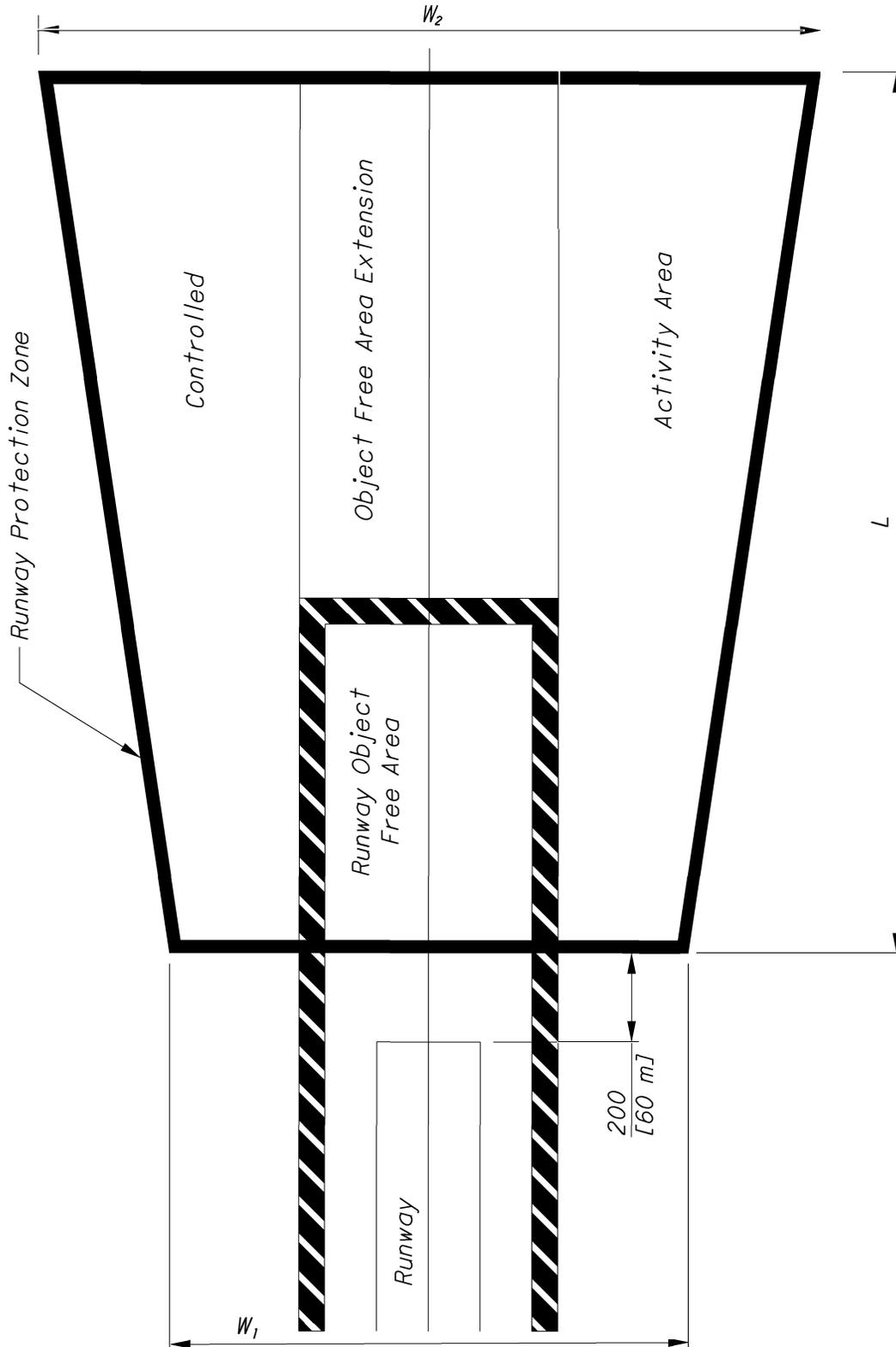
* Contact the Office of Aviation for information regarding approach surface

RUNWAY PROTECTION ZONE

1407-5

REFERENCE SECTION

1407.1.6



For Dimensions L , W_1 , and W_2 see Figure 1407-6.

DIMENSIONS FOR RUNWAY PROTECTION ZONE	1407-6
	REFERENCE SECTION 1407.1.6

FACILITIES EXPECTED TO SERVE	RUNWAY END		DIMENSIONS FOR APPROACH END		
	APPROACH END	OPPOSITE END	LENGTH L	INNER WIDTH W ₁	OUTER WIDTH W ₂
			Ft.	Ft.	Ft.
ONLY SMALL AIRPLANES	V	V	1000	250	450
		NP	1000	500	600
		NP ³ / ₄ P	1000	1000	1050
	NP	V NP	1000	500	800
		NP ³ / ₄ P	1000	1000	1200
LARGE AIRPLANES	V	V NP	1000	500	700
		NP ³ / ₄ P	1000	1000	1100
	NP	V NP	1700	500	1010
		NP ³ / ₄ P	1700	1000	1425
ALL	NP ³ / ₄	V NP NP ³ / ₄ P	1700	1000	1510
	P	V NP NP ³ / ₄ P	2500	1000	1750

- V** = Visual approach
NP = Nonprecision instrument approach with visibility minimums not more than ³/₄ statute mile
NP ³/₄ = Nonprecision instrument approach with visibility minimums as low as ³/₄ statute mile
P = Precision instrument approach

For locations of L, W₁, and W₂ see Figure 1407-5.

SAMPLE LETTER OF AIRWAY/HIGHWAY CLEARANCE ANALYSIS	1407-7
	REFERENCE SECTION 1407.1.7

District Production Administrator
Title
ODOT-District Office
Address
City, State & Zip

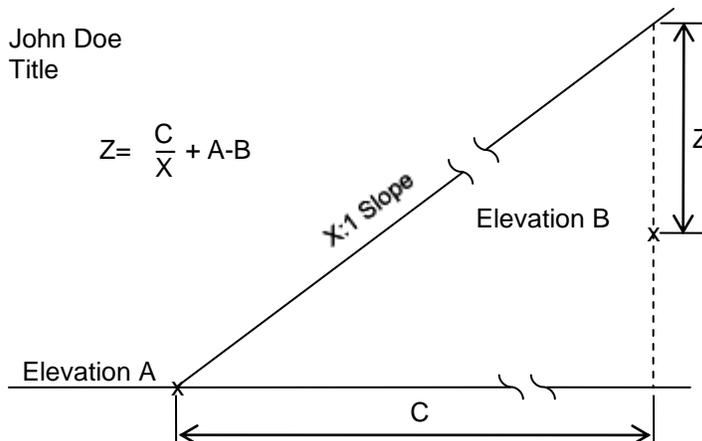
Re: Airway/Highway Clearance Analysis
County-Route-Section
PID:

Dear Mr. /Ms. :

We have reviewed the above mentioned project and have determined that the project (will/will not) not encroach into the (X:1) notification surface. This determination is based on an airport elevation of (A) feet, a project elevation of (B) feet, with a distance of (C) feet between the airport and the project locations. The attached diagram will provide a detailed analysis of the study. The study has also determined that a height of (Z) feet exists between the (X:1) notification surface and the project. Therefore, based on this height and the heights from Figure 1407-3, plan note [G118A: Use note G118A when the construction equipment penetrates the notification surface of a public use airport or heliport; G118B: Use note G118B when the construction equipment does not penetrate the notification surface of a public airport or heliport; or G118C: Use note G118C when the construction equipment penetrates the notification surface of a private use airport.] (will/will not) be required.

Respectfully,

John Doe
Title



- X:1 - Notification Slope [See Section 1407.1.2 to determine Notification Slope]
A - Airport Elevation
B - Project Elevation
C - Distance between Project and Airport
Z - A positive value of Z is the amount of clearance.
A negative value of Z will require notification.

[The Z value should be calculated at critical points for projects of considerable length and variable heights (i.e. closest point, highest point, etc.).]

[Positive Z values are inserted into Plan Note G118B or G118C, unless the heights from Figure 1407-3 exceed the Z value calculated.]