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## What API RP 752 Does Not Tell You – But People Will Ask

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### ABSTRACT

Over the past several years, Quest Consultants Inc. has conducted building siting studies per API RP 752 for a range of facilities in the United States and abroad. This paper summarizes several of the issues encountered when applying the guidance provided by API RP 752.

While the API recommended practices may not address the full range of hazards a building occupant could experience, other codes such as 29 CFR 1910 do require their evaluation under the “general duty clause” and the Process Safety Management (PSM) program.

What will be outlined in this paper are the “holes” in the API RP 752 guidance as well as possible approaches to address these missing elements. Questions that are simple to ask (e.g., What happens to your siting study if a new facility moves in just past your fence line?) may be difficult or impossible to answer. However, if an impact is realized, do you have to move your building due to your new neighbor’s operation? This is only one example of a host of scenarios that will be addressed in this paper.

### KEYWORDS

Building siting, API RP 752

### INTRODUCTION

The first edition of the American Petroleum Association's (API) Recommended Practice (RP) 752 titled *Management of Hazards Associated with Location of Process Plant Buildings* was released in May of 1995 [1]. The second edition was released in November of 2003 [2]. The third and current edition was released in December of 2009 [3]. While there have been some changes to the RP between the first and third editions, the general purpose of API RP 752 remains as stated in the current (2009) edition.

“The recommended practice (RP) provides guidance for managing the risk from explosions, fires and toxic material releases to on-site personnel located in new and existing buildings intended for occupancy.”

It is clear from the RP 752 language that the risk associated with explosions, fires and toxic material releases to on-site personnel must be evaluated. The question is by whom is the risk calculated and what is an acceptable level of risk?

The answers to the questions above have become more important as the Occupational Safety and Health Association (OSHA) under the authority granted in the Process Safety Management (PSM) rule 29 CFR 1910 [4] has begun to ask facilities for their “Building Siting Study.” Another way to think of the question the OSHA inspector asks is, “Why are these building where they are and how do you justify them being there?”

RP 752 does not specify a specific type of approach that a facility owner must use in order to determine the risk to on-site personnel, nor does it define a risk tolerability level. Thus, it is up to the facility owner to determine the risk and the level of risk tolerability that is acceptable for the on-site personnel inside the buildings subject to the analysis.

RP 752 is general in nature and does not address a host of potential situations that can arise during the execution of an RP 752 analysis and the construction of a Building Siting Study. This paper identifies several of the situations that have occurred during such an evaluation. There may or may not be answers to some of the situations presented but it is important for a facility owner to be aware of potential conflicts between what RP 752 says and how OSHA may interpret the owner's study.

### **General Methodology for Following RP 752**

RP 752 can be addressed with a four step process. The analysis can stop after any step if the level of risk to on-site personnel inside buildings meets the facility owner's risk tolerability.

- Step 1 - Is the subject facility subject to RP 752? This requires the identification of any occupied buildings on-site. If there are no occupied buildings, document this finding and stop.
- Step 2 - Perform what is called a worst-case consequence analysis of flammable and toxic releases throughout the facility. If none of the worst-case releases pose any adverse consequences to the occupied buildings, document the findings and stop.
- Step 3 - If the client cannot stop at the end of Step 2, then perform consequence modeling for what is referred to as a maximum credible event (MCE). This may or may not require the use of failure data in order to define the MCEs. This choice is left to the owner/analyst. Then perform a consequence-based analysis of the impact to the occupied buildings from the MCEs selected. If the level of risk to the occupied buildings associated with the MCE releases is acceptable to the facility owner (based on risk tolerability), document and stop the analysis.

Step 3 often incorporates one or more methodologies in an effort to describe the risk to the occupied buildings. All forms of a process hazards analysis (PHA) produce a **qualitative** risk value, not a **quantitative** risk value for the subject buildings. If the owner is comfortable with a qualitative result, and can defend the analysis, stopping at the end of Step 3 is acceptable.

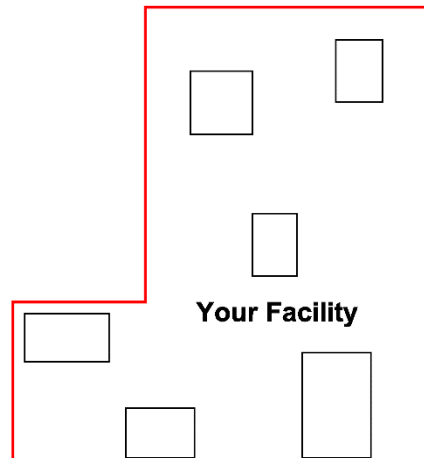
- Step 4 - If there are multiple MCE events that impact the occupied building(s) or mitigation options are not applied, a full quantitative risk analysis (QRA) will need to be performed. Step 4 is a significant effort and requires an investment in time and effort that is beyond Steps 1 through 3.

Using the four step process outlined above, a series of example situations are described below. Some of these situations have been evaluated, and some have yet to be encountered. How the facility owner/analyst approaches each situation is largely up to them as RP 752 does not specifically address many of the following examples, but OSHA “may want to know.”

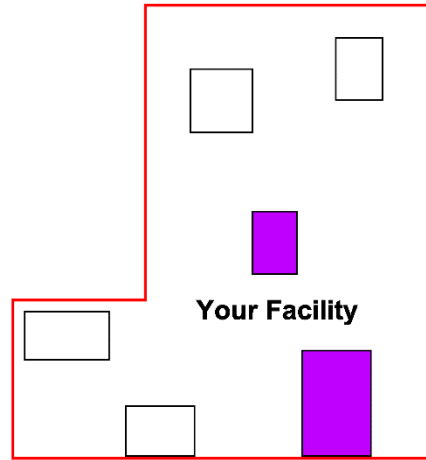
### **Example 1**

Figure 1 presents your facility. This facility handles a range of flammable and toxic substances and is subject to OSHA’s PSM rules. You have identified six buildings on site and you begin your siting study, per RP 752, following Step 1 above. As a result of Step 1 you have identified two buildings as “occupied” per RP 752. These two buildings are identified in Figure 2.

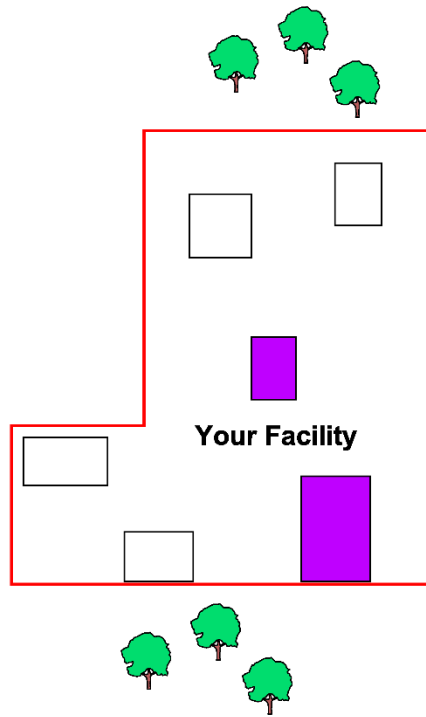
Following the four step process outline above, you perform a worst-case analysis for the flammable and toxic materials in your facility. Assuming none of the worst case releases affect the two occupied buildings in your facility, you are done according to Step 2 above, or are you? What if a flammable cloud drifts into the wooded areas to the North or South, finds an ignition source (inside or outside your facility) and generates an overpressure impact on one or both of your occupied buildings? This situation is presented in Figure 3. Is this part of an RP 752 analysis? Your subject facility generated the initial flammable hazard, but the high overpressure originates outside your facility due to a wooded area outside of your control. Are you required to mitigate the risk posed by the wooded area?



**Figure 1. Your Example Facility**



**Figure 2. Occupied Buildings (Purple) in Your Facility**



**Figure 3. Your Facility with Wooded Areas to the North and South**

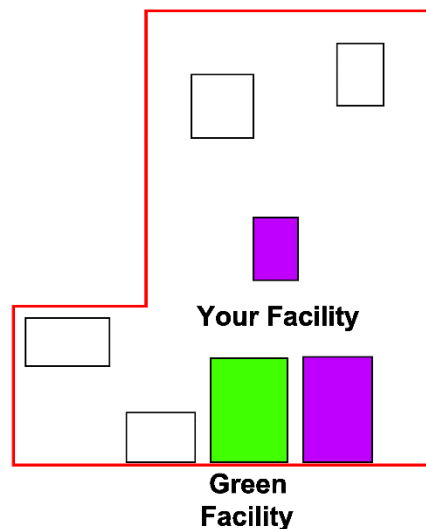
## Example 2

The real estate arm of your company sees an opportunity to sell a plot of vacant land that is located within your facility. The transaction takes place and now your facility boundary is defined in Figure 4. Whether the Green Facility is a PSM facility or not, are you responsible for mitigating any potential impacts to your occupied buildings that originated in the Green Facility?

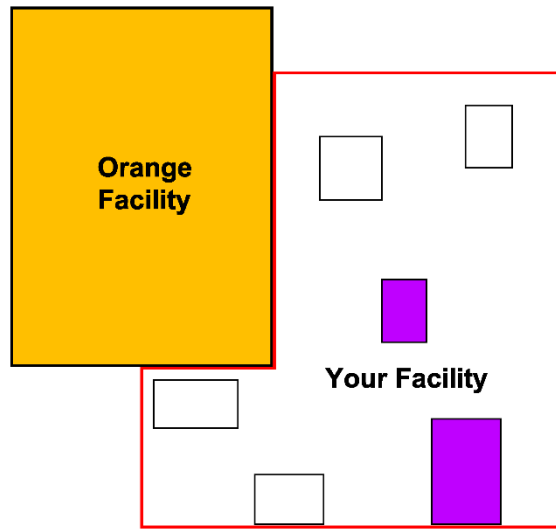
If you are responsible, how do you know how the Green Facility can affect your facility? If you are lucky, the Green Facility is turned into farm land and your facility siting study remains unchanged.

## Example 3

Assuming that your company would not sell property that is within your current fence line, a more common situation is presented in Figure 5. A PSM facility buys the land to the Northwest of your facility. This new facility (Orange Facility) is being built and works to collaborate with you in an effort to satisfy the requirements of RP 752 for both facilities. In order to collaborate, both Your Facility and the Orange Facility work together to follow the four step process outlined above. If you find that an unacceptable level of risk to your occupied building(s) originates in the Orange Facility, are you responsible to upgrade or relocate your building(s)? Or, it is incumbent on the Orange Facility to change their process or change the layout of their facility?



**Figure 4. Your Facility with a New (Green) Facility Located Adjacent**



**Figure 5. Your Facility with a New PSM Neighbor (Orange Facility)**

Continuing this example, you have worked with the Orange Facility such that both your facility and the Orange Facility impose tolerable risks to themselves and each other. Now another facility (Blue Facility) buys the land to the East of your facility as shown in Figure 6. You suspect the Blue Facility is covered by OSHA's PSM rule, but the owners of the Blue Facility are not interested in working with you to satisfy the RP 752 requirements. What can you do? Are you responsible for evaluating the risks to your occupied buildings from events that could originate outside your property lines? What are your responsibilities to the Blue Facility? Do you share your consequence/risk results with the owners of the Blue Facility?

#### **Example 4**

Example 4 combines Examples 1 and 3. In this example, presented graphically in Figure 7, several situations are presented that are not addressed by RP 752. They can be summarized as follows.

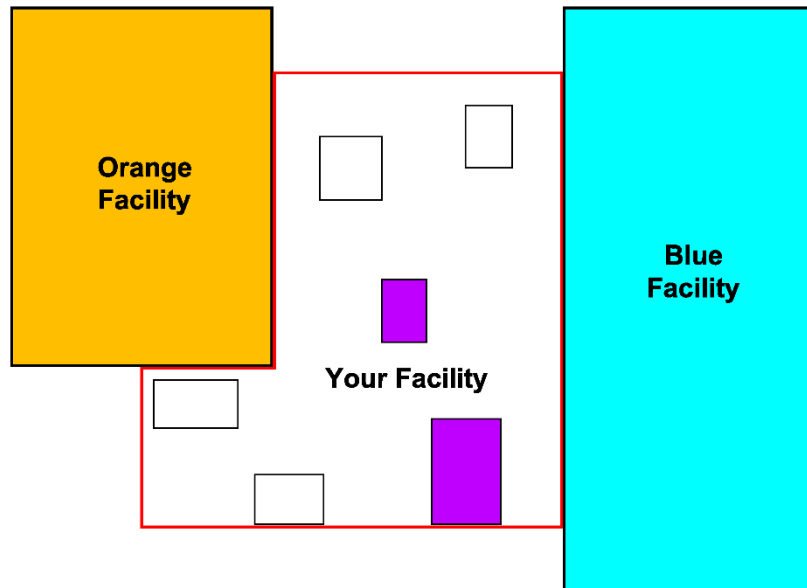
1. If a release originates in your facility that travels off-site (e.g., into the trees outside your facility property line) but can produce an unacceptable risk to your occupied building(s), are you to include those risks in your RP 752 analysis? If so, do you need to modify your facility to mitigate that risk?
2. If a new facility (Orange and/or Blue Facilities) moves in adjacent to your existing facility, what are your responsibilities? Do you have to alter your occupied building(s) or plant layout to satisfy your company's risk criterion due to risk(s) (real or perceived) from neighbors? What are your responsibilities to these new neighbors?

#### **Example 5**

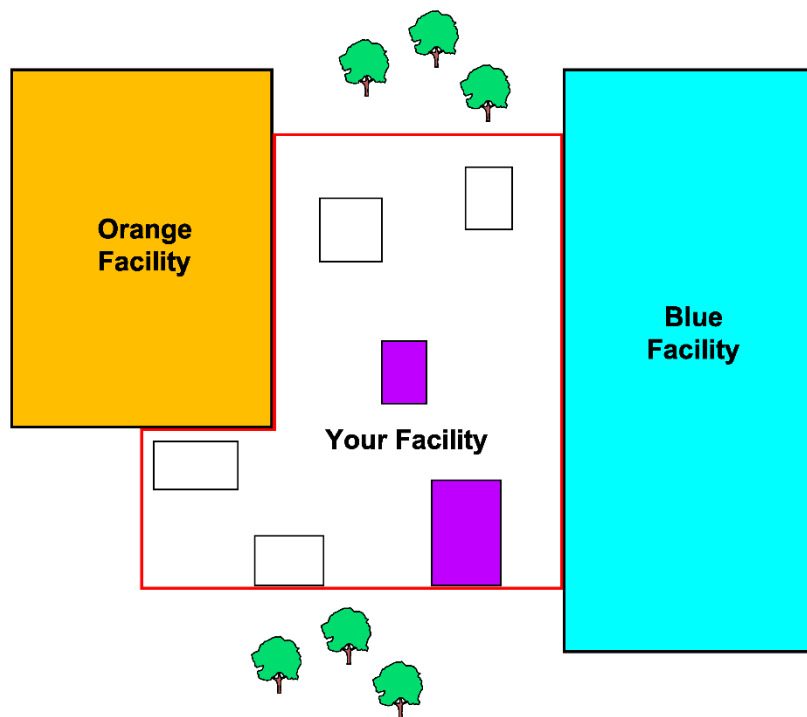
In this example, the Blue Facility is an existing facility as presented in Figure 8. Your company has purchased the land to the West of the Blue Facility and has identified the occupied buildings within your facility and has designed your site such that your facility meets the requirements of RP 752 for releases that originate within your facility. The layout of your facility by the Blue Facility is presented in Figure 9.

Are you responsible for designing your facility layout such that any potential risks associated with the Blue Facility are incorporated in your siting study? This would include releases of flammable and/or toxic materials from within the Blue Facility whether or not the hazard is realized within the Blue Facility. An example would be a release of flammable material in the Blue Facility that travels into your facility, finds an ignition source, and produces an intolerable overpressure risk to one or more of your occupied buildings.





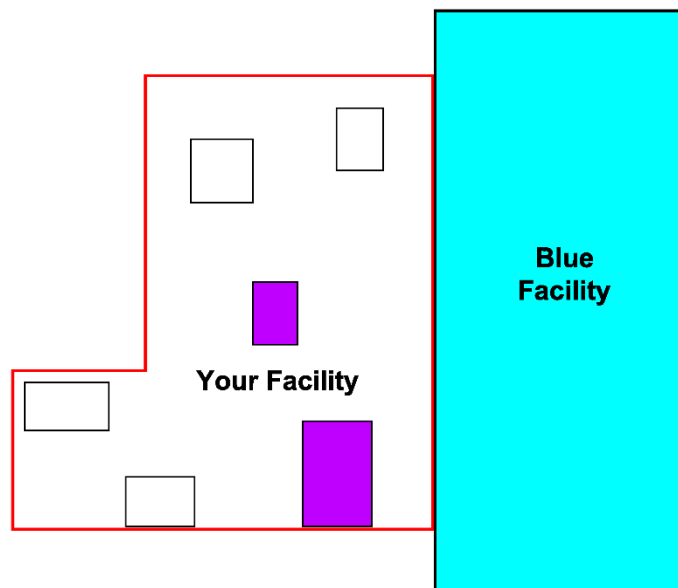
**Figure 6. Your Facility with a New (Blue Facility) Non-cooperative Neighbor**



**Figure 7. Your Facility Surrounded**



**Figure 8. Existing Blue Facility**



**Figure 9. Your Facility (New) Located by the Existing Blue Facility**

Are you responsible for identifying the risks due to releases of flammable and/or toxic material that originate within your facility and produce hazards within the Blue Facility?

## **SUMMARY**

Using several simple examples of situations that are in existence today, this paper has raised several important questions that need to be answered. In many cases, the responses may be resolved by a “Who was there first?” This may not work for Example 1 as the trees may be in place before a facility is constructed. If so, are impacts from neighboring property, either natural (such as a wooded area) or man-made (such as the Orange or Blue Facilities) to be incorporated into your facility’s siting study?

If hazards that originate outside your facility’s property line are not included in the RP 752 siting study, will OSHA accept “why” the occupied buildings are located where they are on your site?

What about facilities that were constructed before 1995, before the advent of RP 752? They are still covered by OSHA’s 1910 rule, under the General Duty Clause. Thus, when the OSHA inspector arrives at your facility, you will need to be able to defend your siting study as it relates to occupied buildings. Since the owner of the facility has the ability to select the consequence and risk analysis methodology as well as the risk tolerability criterion, there is considerable leeway in the construction of a siting study that will satisfy API RP 752. Is the owner of the facility allowed to determine the scope of the building siting study? The real issue is one of preparedness. Know how your siting study was constructed, know the assumptions within it and be prepared to defend your decisions.

## **REFERENCES**

1. API (1995), *Management of Hazards Associated with Location of Process Plant Buildings*. American Petroleum Institute’s Recommended Practice 752, First Edition, May, 1995.
2. API (2003), *Management of Hazards Associated with Location of Process Plant Buildings*. American Petroleum Institute’s Recommended Practice 752, Second Edition, November, 2003.
3. API (2009) *Management of Hazards Associated with Location of Process Plant Permanent Buildings*. American Petroleum Institute’s Recommended Practice 752, Third Edition, December, 2009.
4. OSHA (1991), *Code of Federal Regulations, Title 29, Part 1910 (29 CFR 1910)*. Occupational Safety and Health Administration, 1991.