Lesson 3: Activity Sheet 3: STRUCTURAL STEEL

NAME DATE

6. STRUCTURAL STEEL

THE CHIEF facts covering the structural steel can be summarized as follows:

1. Order for furnishing and erecting steel was given to Post & McCord, January 2, 1930
2. First information on steel design supplied January 15, 1930
3. All steel made by Carnegie Steel Company and fabricated by American Bridge Company and the McClintic-Marshall Company, subsidiaries of the United States Steel Corporation
4. Steel shipped from the shops as fast as fabricated and stored in the Pennsylvania Railroad yards at Greenville, N.J. From that place the steel was lightered to wharf on North River and trucked to the site as required
5. Real start of erection on April 1st, 1930
6. Steel for roof (85th floor) set by September 22, 1930
7. Elapse of time, 25 weeks for the erection of 87 stories (including two basements)
8. Tonnage erected on September 22nd, 1930, 57,480 tons
9. Greatest number of men employed on steel erection 350

Size of Task Involved:

The placing of more than 57,480 tons of structural steel in an eighty five story building between the months of April and October was the difficult task that confronted Post & McCord, Incorporated - the contractors who furnished and erected the structural steel.

Eighty percent of this total tonnage was in place on August first, when the building had reached to about the 50th story. During July, 22 stories of steel were placed in 22 working days, involving regular hours and no night work. Progress averaged about 10,000 tons per month for the erection of the entire 57,480 tons. A five-day week prevailed throughout the erection period.

Comparison with other Large Erection Contracts:

The steel tonnage in the Empire State Building exceeds by a large margin that used in any comparable structure. The Chrysler Building utilized 21,000 tons and the 70-story Manhattan Company Building in New York City required 18,500 tons. The Merchandize Mart in Chicago, recently characterized as the world's largest building, required only 38,000 tons. The principal roof of the Empire State Building is 1045'4" above the curb, with a combination airship mooring mast and observation tower 206'8" above this point, to a total height of 1252 feet. The building's completed height will exceed that of the Chrysler Building - now the tallest structure, by something over 200 feet.

Lesson 3: Activity Sheet 3: STRUCTURAL STEEL

NAME DATE

▶ VOCABULARY

Erecting Putting in an upright or vertical position

Tonnage Number of tons

▶ QUESTIONS

1. How many weeks passed between the date that the first order of steel was made and the beginning of construction?

2. How many weeks did it take to erect the entire steel frame?

3. How many tons of steel did the workers usually erect during the course of a month?

4. How many men, at most, were at work on the steel structure?

5. How much more steel was used for the Empire State Building than the Chrysler Building?

6. How many tons of steel were used in total?

7. What was the name of the contractor who erected the steel frame?

Add Your Own Ideas!

8. In the document, the author writes, "During July, 22 stories of steel were placed in 22 working days, involving regular hours and no night work. ... A five-day week prevailed throughout the erection period." Why do you think the author is so proud of these facts that he decided to record them in this notebook?

Main Permanent Standpipe Tied Into Temporary Water System:

The No.1 Standpipe which is 8" in diameter, extends from the street siamese connections up to the 83d floor.

In order to have immediately available at all times, a sufficient supply of water for fire-fighting purposes without waiting for the city fire engines to arrive to hook up to the street siamese connections for No.1 standpipe, this main standpipe was connected up with the temporary water system. By opening a special valve on the 41st floor and starting the large 4" - 100 HP pump on that floor, this standpipe immediately became wet and available for use, with an outlet valve and 200 feet of 2½" fire hose on every floor.

Five additional 8" standpipes which were kept dry, extend from the siamese connections on the three streets up to the 20th floor and are immediately available for hook-up by the city fire engines.

Pumpman - Electrician - Hoisting Engineer, Always on Duty:

To take care of any fire which might occur a 24-hour day service is maintained whereby a pumpman is always on hand to supply water - an electrician to supply necessary light and power - and a hoisting engineer to operate an emergency hoist or elevator for lifting firemen up to the floor upon which a fire might break out.

The above mentioned maintenance men, as well as our night and day watchmen are thoroughly instructed and form the main personnel of our fire-fighting organization.

Each day an inspection is made by different firemen from the local fire headquarters in order that their entire company will be thoroughly familiar with the construction of the building and the facilities available for fighting a fire.

Temporary Toilets for Use of Workmen:

As a part of the temporary plumbing work, it was necessary to construct temporary toilets for the use of the workmen. These toilets were of cast iron construction, each 12 feet long and of the type known as school sinks.

The toilets were erected on every fourth floor from the 2nd basement to the 23d floor inclusive, and on every sixth floor above the 23d floor level.

Lesson 3: Activity Sheet 3: BATHROOMS and FIRES

NAME DATE

▶ VOCABULARY

Standpipe A water pipe for fire hoses

Sufficient Enough

Temporary Not permanent; soon to be changed or removed

▶ QUESTIONS

1. How many people were always on the construction site to deal with a fire if one occurred? What were their job titles?

2. Does the construction company seem to care about whether or not standpipes are available if a fire begins on the construction site? Prove your answer with words from the document.

3. How often did the local firefighters stop by to learn their way around the construction site in case of a fire?

4. What name was used for temporary toilets?

5. List the floors between the 2nd and the 23rd on which toilets were available.

Add Your Own Ideas!

6. Why do you think fires were such a big concern while the Empire State Building was being constructed?

Lesson 3: Activity Sheet 3: DEMOLITION

NAME DATE

TIME INVOLVED IN DEMOLITION WORK

BUILDINGS WRECKED TO SIDEWALK LEVEL

Actual demolition work on the group of buildings started on Sept. 24, 1929 and all the masonery and steel was completely demolished to sidewalk level on Feb. 3, 1930.

The masonry was completely wrecked to sidewalk level on Jan. 13, 1930. Started Sept. 24, 1929, finished Jan. 13, 1930 meant approximately 86 working days to accomplish this task, figuring 4 hours work on each Saturday.

The steel structure was completely wrecked to sidewalk level on Feb. 3, 1930. This work was started on Oct.4, 1929 and finished Feb. 3, 1930 (no Saturday work included) or in approximately 87 working days.

MATERIAL CONTAINED IN SUPERSTRUCTURE

The material disposed of from buildings down to sidewalk level consisted of 16,508 loads of debris, each load having a capacity of 5-1/2 cu. yds. place measurement, or a total of 90,794 cu. yds.

The steel down to sidewalk level consisted of 12,097 tons.

Lesson 3: Activity Sheet 3: DEMOLITION

NAME DATE

▶ VOCABULARY

Demolition	Destruction; taking apart and removing a building in order to put something else in its place
Masonry (Masonery)	Bricks
Superstructure	The part of a building standing above the foundation or basement

Math Facts:

1 yard = 3 feet

1 ton = 2,000 pounds

▶ QUESTIONS

1. In your own words, describe what this document is about.

2. On what dates did the demolition of the Waldorf Hotel begin and end?

3. How many days did it take the workmen to demolish the building (including masonry and steel) to the sidewalk?

4. Did it take more time to demolish the steel or the masonry? How do you know?

5. How many pounds of steel debris had to be taken away in total?

Add Your Own Ideas!

6. What types of materials do you think could be found in the debris and why?

7. Name one thing you think might weigh as much as the steel debris from the hotel.

Lesson 3: Activity Sheet 3: PLUMBING

NAME DATE

PLUMBING

The plumbing installation was made by J.L.Murphy, Inc.,
340 East 44th St., N.Y.City

There is installed in the above building, 51 miles of plumbing piping.

There will be a reserve at all times of 90,000 gallons of water for domestic and fire purposes, although every fixture and every piece of piping may be supplied with water without the aid of any tanks.

Vitreous China plumbing fixtures have been installed to the number of 2500.

The fire-fighting system is the largest and most complete of its kind in any building. There is available for immediate use, eight miles of the best grade, linen fire hose.

The roof drainage system is separate and independent from the rest of the plumbing system. Rain water from certain sections of the building runs through a series of pipes for 1/2 a mile before it reaches the public sewer.

The sanitary drainage system carries water from certain plumbing fixtures a distance of 1300 ft. before it reaches the public sewer.

The water used for the upper section of the building is pumped from one open tank in the basement to a height of 1100 ft. - vertically, in one lift. This is the first time this has been accomplished in a building.

The Vacuum cleaning system is the largest of its type in the world. There are two separate systems; one from the lowest floor up to and including the 30th, and the other from the 31st floor to a distance of 1250 feet above the ground.

Due to the height of the building, the waste from the plumbing fixtures on the first floor and below runs to a separate system which discharges into an ejector from where it is forced to the public sewer.

There are six separate systems of hot and cold water.

The illuminating gas is carried through piping to a height of 1100 feet above the ground.

Lesson 3: Activity Sheet 3: PLUMBING

NAME DATE

▶ VOCABULARY

Domestic	At home; within the building
Plumbing fixtures	Sinks, faucets, toilets, etc.
Sanitary	Kept clean in order to promote health

▶ QUESTIONS

1. List five separate building systems that are included in the plumbing systems.
(For example, fire-fighting hoses are considered part of the plumbing system)

1. _____
2. _____
3. _____
4. _____
5. _____

2. How many plumbing fixtures were installed in the building?

3. How many miles of plumbing piping were installed in the Empire State Building?

4. What do you think is the difference between “roof drainage” and “sanitary drainage?”

5. Water that was pumped to the tallest floors came from which part of the building?

Add Your Own Ideas!

6. Do you think people would have built skyscrapers in the years before indoor plumbing was invented? Explain your answer!

Lesson 3: Activity Sheet 3: COSTS

NAME DATE

EMPIRE STATE BUILDING

Cost of Face Bricks - Laid in Place

Account		Labor	Amount
M-3	Labor	For Bricklayers Apprentices, Bricklayers, Laborers, Hoisting Engineers, etc.	$48,548.06
	Insurance	Average rate 8.516	4,134.35
GC14	Hod Hoist	Labor Proportion Hod Hoist, Plant & Equip.	1,319.21
		Insurance 6%	79.15
GC14	Industrial Railway	Labor Proportion Industrial Rwy.	351.50
		Insurance 6%	21.09
GC14	Mixing Plants	Labor Proportion Mortar Mixing Plants,	78.55
		Insurance 6%	4.71
GC2	General Supervision	Labor Proportion General Organization Payroll	3,060.00
		Insurance Rate 1.75	53.55
MT	Maintenance	Labor Proportion Maintenance Equipment	174.60
		Insurance 8.516	14.86
	Cost of Laying 835,757 Face Bricks		57,839.63
	Gross Labor Cost per 1000 Face Bricks $69.21		

Material

M-3	Material -	Face Bricks, Lime, Sand, Cement, Etc.	34,409.21
GC14	"	Proportion Hod Hoist, Plant and Equipment	1,759.30
GC14	"	Proportion Industrial Railway	230.59
GC14	"	Proportion Mixing Plants	132.87
MT		Proportion Maintenance, Power, oil, gas, water, etc.	175.57
	Material Cost laying 835,757 face bricks		36.707.54
	Gross material cost laying 1000 face bricks, $43.91		

Gross Labor and Material Cost Laying 1000 Face bricks, $113.12

Net Labor Units	No. Laid	Acct.	Straight Time	Excess Time	Total
Face Bricks Laid in Place	835,757	M-3	55.42	1.69	57.11

Ratio Bricklayers	Laborers	Production Per 8-Hr. Day Bricklayers
1	.9	624

Lesson 3: Activity Sheet 3: COSTS

NAME DATE

▶ VOCABULARY

Account	Like a bank account; companies keep money in different accounts on big projects in order to help manage how much is spent
Insurance	A contract given by an insurance agency to protecting the buyer in case of an emergency; in this context, the construction company bought insurance for its workers in case they were injured or got sick on the job
Labor	Work for pay

▶ QUESTIONS

Accountants kept a careful record of the cost of each aspect of the Empire State Building's construction. Summary sheets were then created to show the overall costs of construction. This is an example of a summary sheet.

1. What part of the cost of the Empire State Building's construction does this document show?

2. What was the most expensive cost on this page?

3. What was the material cost for 1,000 bricks?

   What was the labor cost for laying 1,000 bricks?

   How much did it cost to lay 1,000 bricks altogether?

   How many face bricks were laid altogether?

   Estimate the total cost of laying all the bricks.

4. At the bottom of the sheet, it says "Production per 8-Hr. Day Bricklayers," then "624". What do you think "624" represents? In other words, "624" of **what**?

Add Your Own Ideas!

5. Think about all of the different parts of the Empire State Building's construction that would have needed a budget page like this one, and list them below.

Lesson 3: Activity Sheet 3: ELEVATORS

NAME DATE

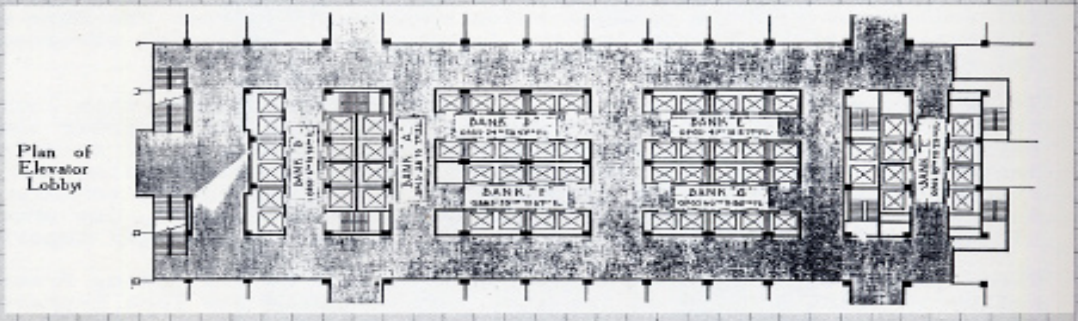
51.

ELEVATORS

We must keep in mind that the eighty-five stories of the building surmounted by a mooring mast tower, rises to a total height of 1,252 feet above the street level. Commensurate with this unprecedented height, the cubical contents of the building is nearly 36,000,00 cu.ft.

Planning the elevator service for a building of these proportions is a special problem necessitating a thorough study of the requirements by competent engineers. Adequate elevator service must be provided to all floors, since the rental value of a floor depends largely upon the character of the elevator service which is provided.

With a building of this height, the problem of securing the necessary elevator service with the least possible encroachment on the net rental area is especially important. Its solution in this case was the selection of high-speed elevators having the most efficient and time-saving method of operation obtainable. This permitted the specifying of the fewest number of elevators for the maximum service required.



Plan of Elevator Lobby

From: "The Empire State Building. VIII. Elevators" by Jones, Bassett in *Architectural Forum* 54 (January 1931) 97.

57.

ELEVATORS - Continued

Interesting Facts Concerning the Elevators

Elevator schedules provide for transporting 15,000 persons from the offices to the ground floor of the building between 5;00 and 5:30 P.M. daily.

Nearly 8,000,000 feet - or over 1515 miles of rubber-covered wire and 190,000 feet - or nearly 36 miles of conduit are utilized in the elevator installation.

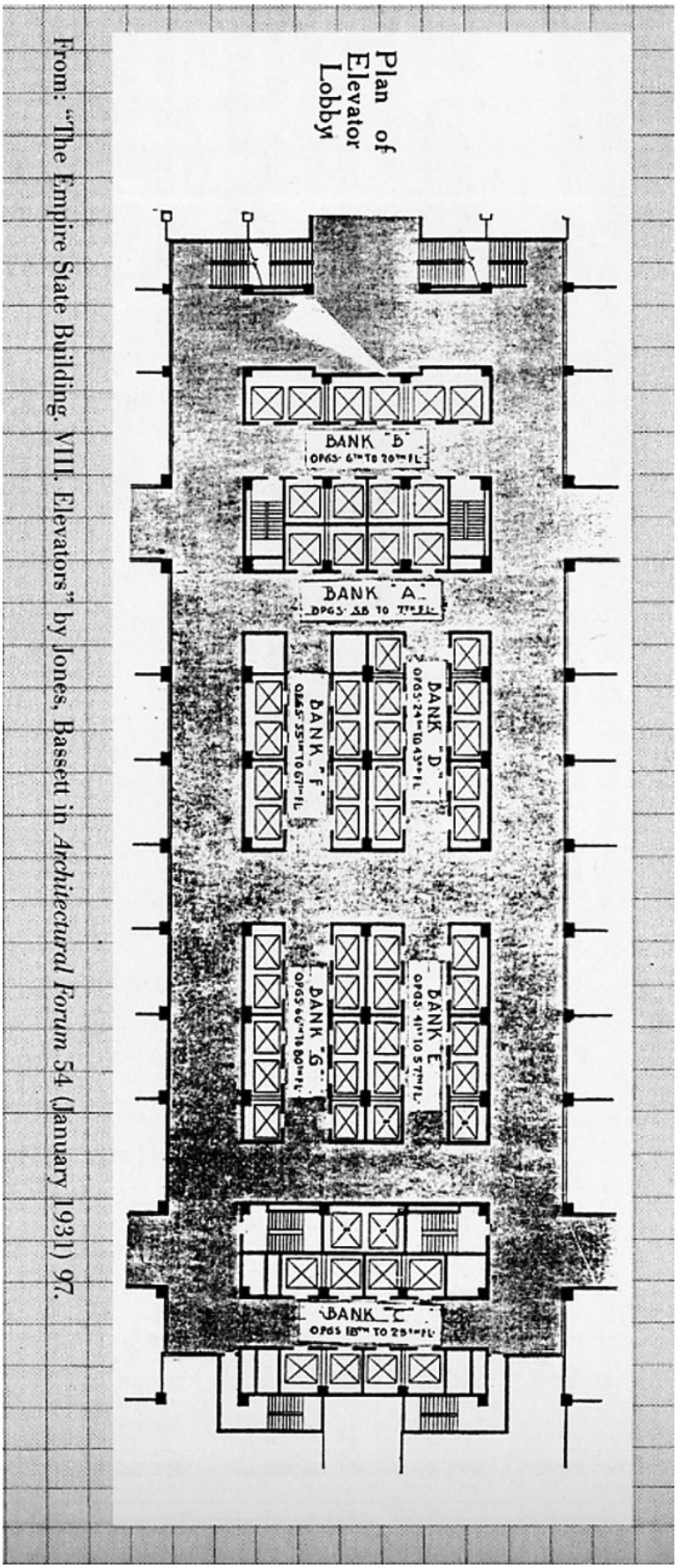
The total length of elevator hoisting ropes, compensating ropes and governor ropes is 636,361 feet - or over 120 miles.

The main and counterweight rails for the elevators total 143,272 feet - or about 27 miles.

Freight elevator No. 1, with a rise of 986 feet has the greatest travel of any of the elevators. This elevator serves a total of 81 openings.

Lesson 3: Activity Sheet 3: ELEVATORS

NAME DATE



From: "The Empire State Building. VIII. Elevators" by Jones, Bassett in *Architectural Forum* 54 (January 1931) 97.

Lesson 3: Activity Sheet 3: ELEVATORS

NAME DATE

▶ VOCABULARY

Encroachment	To go over the boundary; to be in space that belongs to something else
Freight	Materials other than people; A freight elevator may carry mail carts, furniture, computers, etc.
Net rental area	The amount of real space that can be rented out; this would not include hallways, elevator space, maintenance closets, etc.; buildings want a maximum amount of net rental area in order to earn the most money from rent

▶ QUESTIONS

1. Looking at the diagram, how many elevators were included in the initial construction of the Empire State Building?

2. How many people was the building prepared to transport every day between 5:00 and 5:30 p.m.?

3. Why was elevator construction such an important consideration when building an 85-story structure?

4. How is each elevator bank different from the others?

5. What type of elevator was installed in the building? Why?

6. In the document, the author writes, “The rental value of a floor depends largely upon the character of the elevator service which is provided.” What do you think this means?

Add Your Own Ideas!

7. Have you ever ridden in an elevator in a tall building? Describe what it felt like.

If you have NOT ridden in an elevator in a tall building, describe a time you rode in a very slow elevator. Where were you? How did you feel?

Lesson 3: Activity Sheet 3: THE FEEDING PROBLEM

NAME DATE

The Feeding Problem:

Before granting a concession for resturant privileges on the building, the thought in mind was to consult some of the better class resturant owners in the immediate vicinity and find one who in point of integrity, plant and equipment could take care of the flexible demands of a rapidly growing construction organization - one that would reach its peak in a total of 3500 men.

A high class resturant operator, with three resturants in the vicinity was told he could have the privilege for a very nominal sum per month (enough to pay for light and power), if he would agree to have the Builders construct for him, at resturant owner's expense, five lunch stands as the progress of the work required them. These lunch stands were built, when needed, on the 3d floor, 9th floor and 24th floor, 47th floor and 64th floor, and were completely equipeed by the resturant owner and remained in these locations throughout the life of the job.

It was further agreed that he would serve food of the finest quality the same as in his regular resturant, but at slightly reduced rates. In this way, good food at economical prices was purchased by the men and they were completely satisfied throughout the course of the work.

Innumerable inquiries were made by those anxious to secure this valuable concession, but the thought of the General Contractors and the Owners in the matter was that no high price for a rental privilege should be taken from some concessionaire who would have to make his profits by serving inferior food, or high priced food to the men.

The result of the arrangement as worked out, was that the resturant man made a fair profit, the men bought food at cheaper prices than same could be purchased outside the building, and the very vexing problem of getting 3500 men in and out of the building during the lunch hour with limited elevator service was satisfactorily solved. Not more than 15% of the men left the building during the lunch hour period.

Sandwiches of all kinds, hot coffee, milk, near beer, soft drinks, ice cream, candies and cigarettes and tobacco were sold. Hot and cold dishes of food were served on pressed paper plates, or in containers, such as chicken salad, beef stew, beefsteak pie, frankfurters and sauerkraut - and these dishes, which were substantial, could be taken away and eaten in picnic lunch style and became very popular with the men.

Many of the men who brought their own lunches, found that the food was made more palatable by securing a container of hot coffee or milk, or some of the soft drink beverages sold at the lunch stands.

During the life of the entire job not one complaint was received concerning the quality or price of the food served. This is a remarkable record, in view of the fact that the commissary department on every construction operation is generally the source of prolific complaints, and in many cases without justification. When groups of people congregate, whether it be on a construction job, or in the world's finest hotel, a criticism of food seems to be always entirely in order. It is a common trait in human nature.

This service was conducted by James P. Sullivan of Lord's Chain of resturants - main headquarters, 33 West 33d St., N.Y.City.

Lesson 3: Activity Sheet 3: THE FEEDING PROBLEM

NAME DATE

▶ VOCABULARY

Concession Space for a business within another business

Nominal Small

Palatable Tasty

Prolific Many

▶ QUESTIONS

1. How many people did the site's restaurants need to be prepared to serve in total?

2. How many restaurants opened on the construction site in total?

3. Name the floors on which the restaurant sites were located.

4. Why did the owner of the site want to have restaurants of a good quality in the building? Did the plan work?

5. What were some of the items available at the lunch counters?

6. Where there any complaints about the restaurants?

Add Your Own Ideas!

7. Imagine that the construction site did not have a restaurant to feed hungry workers. Name two problems that might have occurred because of the lack of restaurants.

Lesson 3: Activity Sheet 3: BRICKS and TILES

NAME DATE

HANDLING TERRA COTTA, TILE AND FACE BRICK

Terra cotta tile of various sizes and face brick were unloaded from trucks on Main Floor by hand and stacked along railway spurs, where same could be loaded quickly on to Koppel platform cars which were pushed on to the material hoists and raised to the opper floors for further distribution with the aid of the industrial railway system.

A platform car holds 75 pieces of 6" partition tile and up to 175 pieces of 2" tile. The number of intermediate sizes varied accordingly.

The old two-wheelbarrow system accomodates 8 to 12 pieces of tile in each barrow.

The side rocker dump cars carried 21 cubic feet of mortar - the wheelbarrow method, 3½ cubic feet in each barrow.

The partition tile and face brick were kept stacked in advance on each of the three floors above where the bricklayers were setting the material.

Forecast of Quantities to be Placed on Floors in Advance:

A schedule was made showing the estimated quantities of the different sizes of tile, common brick and face brick required on each floor.

By following this schedule, it was possible to have stacked always, three floors ahead, the allotted quantities. This reduced the necessity of rehandling material to a minimum.

Quantities Involved:

An idea of the masonry quantities raised on these material hoists may be gained from the following figures:

Common Brick	10,000,000	
Face Brick	800,000	
6" Terra Cotta	900,000	pcs.
4" " "	210,000	"
3" " "	200,000	"
2" " "	500,000	"
8" " "	10,000	"

The concrete raised for the floor arches (not including fill and finish) amounted to 62,000 cubic yards.

Wire Mesh for floor arch reinforcement	2,900,000	sq.ft.
Beam Clips,	700,000	lin.ft.

Lesson 3: Activity Sheet 3: BRICKS and TILES

NAME DATE

▶ VOCABULARY

Quantity An amount or number

Terra Cotta A type of baked clay, either natural (like brick) or glazed, often used to create decorative architectural pieces

▶ QUESTIONS

1. How were tile and bricks unloaded from the trucks on the main floor?

2. Which seems more efficient: the wheelbarrow system, or the platform car/side rocker system? Why?

3. Why do you think the bricks and tile were stacked three floors ahead of where the bricklayers were actually working?

4. How many pieces of brick were needed for the building, according to the table?

5. How many pieces of tile were needed for the building, according to the table?

6. Terra Cotta, tile, and face brick are used in the construction of which part of a skyscraper?

Add Your Own Ideas!

7. In the document, it says, “This reduced the rehandling of materials to a minimum.” What do you think this sentence means?

8. Why would the company in charge of construction try to find ways to keep workers from working so hard, like inventing new systems for moving bricks? Why do they care whether the workers are working hard or not?

43.

STRUCTURAL STEEL - Continued

The following detailed account of the erection of the structural steel was prepared by Post & McCord and was printed in Engineering News Record, August 1, 1930:

280 ENGINEERING NEWS-RECORD August 21, 1930

Planning and Control Permit Erection of 85 Stories of Steel in Six Months

Empire State Building in New York City Involving 57,000 Tons Goes Up in Record Time—Nine Derricks Starting Work on 425x198-Ft. Site Reduced to Five Above Twentieth Floor—Relay Platforms Necessary in Hoisting Steel—All Hoists Inside of Building

FIG. 1—EMPIRE STATE BUILDING, NEW YORK CITY

THE PLACING of more than 57,000 tons of structural steel in an 85-story building between the months of April and October is the task which has confronted the steel erector on the Empire State Building in New York City. Eighty per cent of this total tonnage was in place on Aug. 1, when the building had reached to about the 50th story. During July, 22 stories of steel were placed in 22 working days, involving regular hours and no night work. As progress has averaged about 10,000 tons of steel per month (working five days a week), it seems probable that the difficult schedule will be met.

This article is devoted to an account of the steel erector's methods and equipment which are of interest and value both because of the magnitude of the project and the careful planning and control which has been exercised. The steel tonnage in the Empire State Building exceeds by a large margin that used in any comparable structure. The Chrysler Building utilized 21,000 tons and the 70-story Manhattan Company Building, both in New York City, required 18,500 tons. The Merchandise Mart in Chicago, recently characterized as the world's largest building, required only 38,000 tons. The principal roof of the Empire State Building is 1,043 ft. above the curb, and latest plans contemplate the addition of a combination airship mooring mast and observation tower approximately 200 ft. tall above this point. The building's completed height will exceed that of the Chrysler Building, now the tallest structure, by something over 200 feet.

In preparing a plan of procedure for the steel erection, it was necessary to consider four major problems: (1) steel supply, which had to take into account the fabrication schedule and methods of delivery; (2) plant layout, including number, size and location of derricks and hoisting engines; (3) steel-handling methods at the job, which necessarily had to be considered as complementary to plant layout in the planning; and (4) actual erection procedure, including methods of setting, fitting up and riveting.

Steel Supply

The large tonnage in the building and the urgency for completion made it advisable to divide the fabricating contract between two firms, the American Bridge Co. and the McClintic-Marshall Co. Alternate sections from the basement to the roof, comprising from two to eight floors each, were assigned to each fabricator. All steel is shipped to a joint waterfront supply yard near Bayonne, N. J., and steel for erection is ordered from this supply yard one lift (two floors) at a time, as needed. Because of possible delays in loading and shipment it is necessary for the steel erector to order steel two days in advance of the time it is to be used. Since there is no storage space at the building site, it is absolutely necessary that everything be in readiness to erect the steel when it arrives.

Steel is delivered from the supply yard to docks on the East River waterfront by derrick-equipped lighters. Columns and heavy members are transferred to trucks at 23d St. while the smaller material comes ashore at 19th St. Since the Empire State Building is between 33d and 34th St. on Fifth Ave., the haul through city streets is not long. The largest shipping pieces were the two bottom column sections, the lower one 15 ft. 8 in. long, weighing 44 tons, and the upper one having about the same weight but being 33 ft. long. By using a two-wheel trailer, the trucks were able to handle these sections as easily as the smaller ones.

At the beginning of the job steel was delivered to the 33d St. side of the building; an unusually wide sidewalk on 34th St. made it impossible for the derricks standing in the excavation to reach trucks on this side. When erection had reached the second floor, however, the derricks could reach either street and steel was delivered on both the 33d and 34th St. sides until erection reached the 46th floor, when unloading on 34th St. was discontinued. All steel is now being received along 33d St. which, although narrow, is a westbound street permitting the trucks to reach the building from the East River waterfront in the most direct manner.

The erection plant is divided into two main parts—

FIG. 2—EARLY ERECTION VIEW OF EMPIRE STATE BUILDING

At stage shown almost 5,000 tons of steel had been erected. Note extent of site which is 198x425 ft. General contractors' offices on bridge over 5th Ave. is foreground. Note complete planking of top floor forming a safe working platform for the steel erectors. Also at left, trucks unloading steel and materials along 33d St. side.

Lesson 3: Activity Sheet 3: STRUCTURAL STEEL 2

NAME DATE

▶ VOCABULARY

Erecting Putting in an upright or vertical position

Fabricating Making; creating

Hoisting To raise up with the help of a machine

Tonnage Number of tons

▶ QUESTIONS

1. What is the name of this newspaper? Who do you think reads it?

2. Why did the people in charge order steel from two different companies? (The article gives two reasons.)

3. How many days in advance was the steel ordered from the supply yard?

4. Describe two major problems mentioned in this article.

   1.

   2.

Add Your Own Ideas!

5. How do you think the author feels about the erection of the structural steel at the Empire State Building?